



**THE GAMBIA AGRICULTURAL RESEARCH AND  
DIVERSIFICATION STUDY**

**IQC Contract No. PDC-1406-I-00-7007-00  
Delivery Order No. 28**

**Prepared for:**

**USAID/BANJUL**

**Prepared By:**

**Dr. John Conje, Production Agronomist  
Dr. James Dickey, Livestock Specialist  
Dr. Clarence Idyll, Fisheries Specialist  
William Litwiller, Farm Economist/Team Leader  
Dr. Robert Olson, Marketing Economist**

**Chemonics International Consulting Division  
2000 M Street, N.W., Suite 200  
Washington, D.C. 20036**

**August 26, 1989**

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## EXECUTIVE SUMMARY

The purpose of this study has been to review and evaluate past government and donor interventions and to suggest programs which offer the most potential for diversification of the agriculture sector. These should increase the diversity of agricultural output, improve the stability of domestic food supplies, and increase agricultural exports and foreign exchange earnings.

The Gambia has unique opportunities for further development: a favorable climate, an ocean port, a navigable river, and attractive beaches. Among major constraints to development are shortages of trained personnel for senior agricultural and fisheries posts; an underdeveloped infrastructure, including communications, roads, and bridges; and less than effective primary and secondary education systems.

The economic reform program is making progress but it limits development options, especially direct action by the government.

Interventions are described which could: (1) increase production of millet, maize, sesame, and rainfed rice; (2) promote the development of horticulture and introduce a wider range of cash crops; (3) increase production of fruit and vegetables; (4) increase the productivity and profitability of the livestock industry through improved health and nutrition; (5) develop a unified range, crop, and forest land management policy; (6) gain the benefits from the fishery resource in the Gambian Extended Economic Zone; (7) promote and support the development of aquaculture; (8) assist women farmers in rice production and credit union creations; (9) facilitate more private investment in commercial agriculture and agribusiness; (10) privatize the production of cotton, the distribution of fertilizer, and the marketing system for livestock and animal products; (11) extend the training of research and extension staff; (12) strengthen the coordination between research and extension, and among ministries; and (13) continue or strengthen research on several crops and on livestock and fisheries problems.

These programs should result in increased food production and food stability. It is suggested that the government of the Gambia should increase the training and travel expenditures for its field and research staff. The government is also encouraged to negotiate donor technical assistance, offer tax incentives to investors, and, in general, facilitate commercial development investment. Coordination among donors and NGOs should be strengthened.

There should be little impact on the Gambian budget from these recommendations since it is suggested that donors be requested to help with for technical assistance and overseas training. The government should look for ways to raise revenue to pay for increased services such as user fees.

## THE CONSULTANTS

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Mr. Litwiller, during a 33-year career with the U.S. government, served in a variety of positions with Iowa State University, the Agency for International Development and the U.S. Department of Agriculture. He has served on long-term assignments in Kenya, Tunisia, and Cameroon. Since retiring from federal service in 1985 as chief agriculture officer, USAID/Cameroon, he has served on design and evaluation assignments for USAID.

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Dr. Conje has 29 years of experience in production agronomy in Asia, Africa, the Middle East, Latin America, and the United States. He was senior production agronomist for a commercial horticultural firm in the Philippines and has coordinated with both the private sector and government agencies for the development of the seed industry in Thailand. He has served on the staff of Iowa State University and the University of the Virgin Islands and has served in a senior agricultural management position with USAID/Guyana. He also served as a team member to evaluate agricultural diversification programs in the Sudan, Chad, Equatorial Guinea, Costa Rica, and Honduras.

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Dr. Clarence P. Idyll - Fisheries Scientist

Dr. Idyll was chairman of the Department of Fishery Sciences at the Institute of Marine Sciences, University of Miami, for 25 years. He was senior scientist in the Fisheries Department of the Food and Agriculture Organization in Rome for three years, and worked as senior marine scientist for the National Oceanic Atmospheric Administration, and as chief, Office of International Fisheries, National Marine Service, U.S. Department of Commerce.

Mr. Robert E. Olson - Marketing Economist

Mr. Olson has served as a marketing economist for the Economic Research Service of the USDA for 20 years. He has also served on the staff of South Dakota State University and has served consultancies in the Philippines, Saudi Arabia, and the Caribbean. Mr. Olson has also served on a long-term assignment as a market economist in Lesotho.

## ACRONYMS

AA	Agriculture Assistant
AD	Agriculture Demonstrator
AfDB	African Development Bank
AVDRC	Asian Vegetable Research and Development Center
BADEA	Arab Bank for Economic Development in Africa
CBPP	Contagious Bovine Pleuropneumonia
CDC	Colonial Development Corporation
CECAF	Committee for Eastern Central Atlantic Fisheries
CGIAR	Consultive Group on International Agriculture Research
CILSS	Permanent Inter-State Committee on Drought Control
CMB	Cattle Marketing Board
CRS	Catholic Relief Services
CS/RM	Cropping System/Resource Management Research Program
DAHP	Department of Animal Health and Production
DANIDA	Denmark Development Corporation
DAR	Department of Agriculture Research
DAS	Department of Agriculture Services
DLS	Department of Livestock Services
DOA	Department of Agriculture
DOP	Department of Planning
DWR	Department of Water Resources
EDC	Economic Development Fund
EEC	European Economic Community
EEZ	Exclusive Economic Zone
ERP	Economy Recovery Program
FAI	Italian Aid Fund
FAO	Food and Agriculture Organization
FFHC	Freedom from Hunger Campaign
FITT	Farmer Innovation Technology Testing Program
FMC	Fish Marketing Company
FPMC	Fish Processing and Marketing Company
FSR/E	Farming System Research and Extension
GAMB	Gambia Agricultural Marketing Board
GARD	Gambia Agriculture Research and Diversification
GCU	Gambia Cooperative Union
GDP	Gross Domestic Product
GNFRB	Gambia National Fisheries Research Program
GOC	Government of Cameroon
GOTG	Government of The Gambia
GOTN	Government of the Netherlands
GPMB	Gambian Produce Marketing Board
GTZ	German Agency for Technical Cooperation
IARC	International Regional Agricultural Research Center
IBRD	International Bank for Reconstruction and Development

ICRISAT	International Crop Research Institute for Semi-Arid Tropics
IDRC	International Development and Research Corporation (CANADA)
IEMVT	Institut d'Elevage Médecine Vétérinaire Tropical
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
IITA	International Institute of Tropical Agriculture
ILCA	International Livestock Center for Africa
ILRAD	International Laboratory for Research on Animal Diseases
IRDP	Irrigated Rice Development Program
ITC	International Trypan-tolerant Research Center
JICA	Government of Japan
JPSP	Jahally Pacharr Smallholder Project
KfW	Kreditanstalt für Wiederaufbau
LMB	Livestock Marketing Board
LRD	Lower River Basin
MFP	Mixed Farming and Resource Management Project
MID	MacCarthy Island Division
MOA	Ministry of Agriculture
MSY	Maximum Sustainable Yield
NARB	National Agriculture Research Board
NASS	National Agriculture Sample Survey
NCB	Nigerian Composite of Maize Variety
NGOs	Non-Government Organizations
NPE	National Partnership Enterprises
ODA	Overseas Development Assistance
PRC	People's Republic of China
RDP	Rice Development Project
SCF	Save the Children Foundation (USA)
SDPT	Sahel Development Planning Team
SWMU	Soil and Water Management Unit
TA	Technical Assistance
UNDP	United Nations Development Program
URD	Upper River Division
UK	United Kingdom
US	United States
USAID	United States Agency for International Development
YBK	Yoro Beri Kunda

## SUMMARY

### A. Introduction

Agricultural diversification has been perceived as a requirement to the well-being of the people of The Gambia since 1860. The purpose of this study has been to review and evaluate past government and donor interventions and to suggest programs which offer the most potential for diversification of the agriculture sector. These should increase the diversify of agricultural output, improve the stability of domestic food supplies, and increase agricultural exports and export earnings. This study was completed during the period May 25 to July 25, 1989. The following definition was prepared for clarification purposes:

Agricultural diversification in The Gambia is the development of policies, strategies, programs, and projects designed to increase the variety of agricultural products, including fish products available for domestic consumption and export. Agricultural diversification may mean some small farmers will be encouraged to specialize in fewer crops while others will be encouraged to produce a variety of crops. Large commercial farmers may be encouraged to specialize in a single crop for a special market, domestic or export. The ultimate objective of agricultural diversification is to make the agriculture sector more productive, and to increase food security, farmer and fisherman incomes, the gross domestic product, and export earnings through the shipment of more and higher valued agricultural products.

### B. The Development Opportunities

The Gambia has unique opportunities for further development; among them are a favorable climate for the production of a variety of crops, an ocean port, a navigable river, a trading tradition, N'Dama cattle for possible export, and attractive beaches for tourists. The potential for diversifying field crops, fruits, and vegetables, and increasing productivity within the same or reduced livestock herds is favorable. More effective and profitable utilization of the fishing resources, and a free economy and expansion of free trade with neighbors are also development opportunities.

The economic reform program is making progress but it limits the development approaches that are open.

Because of The Gambia's long border with Senegal, agricultural products tend to move freely between the two

countries. Grains and livestock are often marketed across the border.

#### C. The Agriculture Sector

The typical farm is about 4.2 hectares in size with a labor equivalent of 12 adults. Groundnuts are the most important crop, with millet, maize, sorghum, and rice as important secondary crops. Total agricultural production has been lagging, and, in spite of numerous rice schemes, rice production is far behind consumption. Although Gambian farmers are more mechanized than most African farmers, poor crop husbandry methods (like inadequate weeding) have greatly reduced yields and hectares harvested. Gambian agriculture can be described as mixed farming whereby crops and livestock complement each other and increase total production. This mixed method also supplies considerable crop residues for animal feed.

The typical farm has about six head of cattle, six head of sheep and/or goats, and one or two draft animals (donkeys, oxen, horses). Essentially all farms keep poultry. Livestock has an important role in the farming system as more than 90 percent of the farming units (dabadas) have some type of livestock other than poultry. Oxen, donkeys, and horses are utilized in the plowing, seeding, and cultivating of groundnut, millet, and maize.

Cattle and small ruminants are handled in a traditional manner and the animal offtake is considered low even though the per-unit area is somewhat above most African countries. Considerable opportunity exists for improved productivity through better animal health care and management. Nearly 20 percent of the Gambian dietary protein is produced by domestic farm animals. With the improved productivity suggested in this report, this level of animal protein supply can be increased with the same number of livestock or maintained at the present level with only 88 percent of the present herd.

#### D. The Fisheries Sector

Fisheries are vital to the food security of the Gambians, who depend on fish for a high proportion of their calories and a large portion of their nutritionally valuable animal protein. Next to agriculture, fishing provides more employment than any other activity, and good fishermen earn considerably more income than good farmers. The main sector is the active and productive marine artisanal fishery. With the help of successful development projects, this fishery is expanding its production and quality. The small but productive offshore industrial fishing grounds are yielding a rich harvest, but The Gambia has lost control of this resource both in terms of receiving a fair return for the fish caught and marketed by foreign vessels and in

terms of control over those vessels. Until recently, The Gambia has had no aquaculture, the area of fish production showing the greatest growth world-wide. The potential in this area is great, and a promising start has been made in shrimp farming. There is a high likelihood of return from well-planned intervention in the fisheries sector, and the United States has a good comparative advantage in several of the areas where The Gambia requires assistance. It is recommended that The Gambia: (1) take advantage of the momentum in the artisanal fishery, and continue to promote and improve this sector; (2) re-assess and re-design its use and control of the offshore industrial fishery; (3) establish long-term plans for the development of aquaculture; (4) make plans for establishing a research program based on essential needs of the artisanal and business fishing communities; and (5) take the lead in strengthening international cooperation in fisheries research, development, and control.

#### E. Marketing of Agricultural Products

The marketing of groundnut, cereal, livestock, and fish products is a challenge to The Gambia. The lack of infrastructure including bridges, hard-surface roads, railroad depots, and a fully developed port is a constraint. The processing of fruits and vegetables, and of livestock products and fish is largely undeveloped. Many of the past marketing schemes, mostly operated by the government, have been less than successful. However, the present economic reform program is an excellent opportunity to privatize these parastatals to gain increased marketing efficiency.

#### F. Research, Education, and Extension

The Gambia is critically short of qualified people to do agricultural and fisheries research, planning, statistics gathering, analysis, and extension work. The Gambia's primary, secondary, and higher education institutions are in need of strengthening. Agricultural scientists, statisticians, and economists are in short supply especially in the Departments of Agricultural Research and Planning. Staff training should be developed to meet these needs and should include educational programs in The Gambia and abroad.

Agricultural and fisheries extension programs should be strengthened by in-service training and improved management. Extension approaches should take into consideration the limited staff and the recurrent funds that are available.

Agricultural research efforts since independence have met with limited success. The production of cereals (including rice) has not expanded as scheduled. Extension programs with farmers have met with limited success; the exceptions being maize hectareage expansion (two and one half the original hectareage),

sesame seed production expansion, and an extension education effort in animal traction (over 70 percent of the farmers have access to this form of mechanized farming).

G. Policy and Program Recommendations

Major specific policy and program recommendations are as follows:

1. Increase Production of Millet

- o Coordinate with IARCs (ICRISAT, IITA) millet and sorghum programs
- o Include Gambian cultivar as one parent in IARC crosses
- o Coordinate on-farm variety testing and link varietal improvement work with soil fertility, intercropping, and economic analysis
- o Reduce post-harvest losses
- o Develop "convenience" equipment for processing millet

2. Develop Commercial Horticulture and Promote Increased Foreign and Domestic Investment

- o Short-term technical assistance to study profiles of horticultural firms and cooperatives
- o Long-term technical assistance to help develop sector

3. Continue to Promote Maize Production Programs

- o Produce high-quality maize seed (private sector)
- o Strengthen maize extension efforts and promote fertilizer availability through the year
- o Maintain a modest maize research program

4. Continue to Support Sesame Production Programs

- o Strengthen the growers associations
- o Continue on-farm trials

5. Promote the Increase of Rainfed Rice Production

- o Promote animal traction

- o Continue to develop management package for women farmers
  - o Promote extension education to reduce post harvest losses
  - o Continue research efforts on rainfed rice
6. Introduce and Test a Wider Range of Food and Cash Crops
- o Designate a plant introduction coordinator to bring new crop species into the country and test them
  - o Further research on promising introduced crops
  - o Promote commercial exploitation of important crops
7. Privatize the Cotton Industry
- o Use tax incentives to encourage privatization
8. Form Women's Credit Unions for Women Rice and Vegetable Farmers to Increase Labor Productivity
- o Provide long-term technical assistance to train credit union managers and officers
  - o Provide limited commodities to establish credit union offices and support T.A. advisors
  - o Encourage women to save and borrow money to secure off farm inputs such as seeds, farm implements, and fencing materials
9. Provide Animal Health and Nutritional Care Delivery and Inspect Meat
- o Strengthen preventive vaccination delivery service
  - o Make nutritional outputs available at the DLS/LOA posts for use to conduct proven interventions; lackating cow and post weaning supplement
  - o Facilitate PPR vaccination and internal parasite control in small ruminants
  - o Promote Newcastle disease control for village-level poultry
  - o Continue meat inspections by DLS and collect tax to pay for animal health care program

10. Emphasize a Unified and Integrated Range, Crop, and Forest Land Management
  - o Mandate a unified natural resource policy for DLS, DOA, and DOF to promote early burning; define grazing by tradition herd movement methods and traditional use of crop residue
  - o Establish a committee from the three departments to determine research efforts within the traditional land use system to evaluate and suggest opportunities for improvement and/or policy changes
11. Reinstate a Private Marketing System for Livestock
  - o Privatize management and/or ownership of central abattoir
  - o Sell LMB stock in tannery and permit management to buy hides and skins domestically or internationally through the private traders
12. Strengthen the Free-market Imports for Animal Products, Feed Grains, and Commercial Animal Production Inputs to Encourage Commercial Livestock Production
  - o Allow free imports of animal products to make the cheapest source of animal protein available to the general public
  - o Permit free import of feed grains to facilitate an early start-up of the poultry and other commercial feeding enterprises when animal product prices are high and grain prices are relatively low
13. Increase the Benefits from Fisheries Resources in The Exclusive Economic Zone
  - o Re-assess the conditions and rules under which foreign vessels may harvest the fishery resources of the EEZ
  - o Invest greater resources and effort in observation, surveillance, and enforcement to gain more of the potential advantages of income and resource conservation
14. Develop and Support Appropriate Fisheries Research
  - o Design and initiate a fisheries research program based on: (1) the most urgent practical needs of the artisanal and industrial fisheries, (2) the national

responsibility to conserve the renewable fisheries resource, and (3) the present and future national capacity in trained manpower and financial resources

15. Promote and Support the Development of Aquaculture
  - o Develop a long-term plan for aquaculture development
  - o Take advantage of international advances in fisheries and aquacultural research and development
16. Facilitate More Private Investment in Commercial Agriculture and Agribusiness
  - o Seek funds from private sources, Gambian or foreign
  - o Provide technical assistance to investors regarding local investment opportunities and marketing opportunities abroad
17. Use Comparative Advantage For Fruit and Vegetable Production and Facilitate Vertically Integrated Enterprises
  - o Develop access to overseas markets and tailor production to meet specific market demands in Europe and the Middle East
  - o Encourage linkage between large commercial enterprises and small fruit and vegetable production
18. Privatize and Improve the Fertilizer Distribution Sector
  - o Develop specific plans to complete the divestiture of importation and distribution; use experienced professionals such as present or retired staff of the IFDC for the study
19. Emphasize Staff Training For Research and Extension
  - o Encourage bimonthly training for all field staff
  - o Produce extension bulletins and newsletters to help increase field staff efficiency
  - o Encourage overseas training for senior staff
  - o Request necessary funds from the government for six training sessions per year for a total of 15 days per year; include funds for transportation, overnight allowances, and training materials

- o Encourage program leaders and other specialists at national and divisional level to provide the necessary instruction
  - o Encourage research officers to contribute to extension
20. Strengthen Research and Extension Coordination
- o Coordinate research and extension activities through the deputy permanent secretary
  - o Predicate all research and extension programs on the limited staff and physical resources available
21. Develop and Strengthen Inter-ministerial Coordination
- o Recognize that four ministries are directly involved in GOTG agricultural diversification and establish plan for intensified coordinated effort
22. Emphasize Provisions for Capital Goods Replacement in All Projects
- o Declare as policy that plans be made in all projects for timely replacement of buildings, machinery, and equipment to prevent a constraint on productivity

#### H. Budget Impact

The impact on the GOTG budget of the diversification policy and program recommendations will be minimal because, in keeping with the general policy direction set by the Economic Recovery Program, the recommendations emphasize redirection of current activities in order to free GOTG resources for diversification activities and private investment for the development of commercial agriculture and agribusiness. Some privatization, research, and extension activities will not require any increases in Gambian professional staff, professional staff support, or external technical assistance. Short-term training in The Gambia, animal health and interventions, and expansion of extension publications will require increases in the GOTG budget. Implementation of long-term technical assistance programs will require assignment of GOTG counterparts. Savings from privatization, reassignment of posts, fees for meat inspection of slaughter, and increased fishery rents should offset the increases in expenditures.

## CHAPTER I

### A REVIEW OF THE ECONOMIC ENVIRONMENT, GOVERNMENT POLICIES AND THEIR IMPACT ON DIVERSIFICATION EFFORTS

#### A. Agricultural Diversification in The Gambia

Dependence on a single export crop, groundnuts, has been perceived by the authorities as a risk to the well-being of Gambians for many decades. The risks include famine as a result of crop failure, sudden drops in world market prices, and isolation from foreign outlets due to war, internal conflict, etc. In 1860, the British Colonial Governor reported his concern about a single export crop in an official report. Various attempts were made during the colonial period to introduce other export crops without much success and groundnuts remain the principal export crop in The Gambia. Agricultural diversification programs and projects for The Gambia have been widely discussed and many efforts to diversify have been undertaken since the mid-1960s. Since "agricultural diversification" could have a different meaning to persons with varied viewpoints a definition of the term as it applies to The Gambia follows:

Agricultural diversification in The Gambia is the development of policies, strategies, programs, and projects designed to increase the variety of agricultural products, including fish products available for domestic consumption and export. Agricultural diversification may mean some small farmers will be encouraged to specialize in fewer crops while others will be encouraged to produce a variety of crops. Large commercial farmers may be encouraged to specialize in a single crop for a special market, domestic or export. The ultimate objective of agricultural diversification is to make the agriculture sector more productive, and to increase food security, farmer and fisherman incomes, the gross domestic product, and export earnings through the shipment of more and higher valued agricultural products.

In other words, given the resource endowment of The Gambia, the goal of diversification is to find the combination of commodities (crops, livestock, forestry, fish), and technologies with the greatest comparative advantage. This would achieve the highest output of food and export earnings, and the largest income for the majority of Gambians dependent on the agricultural sector for their livelihood.

## B. Unique Country with Unusual Opportunities and Constraints

The Gambia is a distinctive country in West Africa with a unique geographic location, hospitable people, and unusual opportunities and constraints for economic development.

### 1. Unique Opportunities

#### a. Unique Geographic Location

The Gambia's unique geographic location encourages further economic development. The country is in an excellent location to serve as a regional center for trade and development. Its amenities include the following:

##### (1) Ocean Port

The port at Banjul could be a valuable trading asset for The Gambia. The country now imports foods and other goods for re-export to neighboring countries. The Gambia could import raw materials, process them, and reship them as effectively as such port cities as Hong Kong and Singapore. Banjul's port facilities are equipped now to ship some agricultural produce abroad and to import consumer and industrial goods. These facilities could be more fully developed.

##### (2) Navigable River

The Gambia River is one of the most navigable in Africa. Ocean-going ships with an up to 5.5-meter draft can sail as far as 240 km. upstream to Kuntaur. Shallower draft vessels can go as far as Koina. River craft can travel to Fatoto, the last of the river wharf towns, which is 464 km. from Banjul. While the river is used for trade in groundnuts, it is by no means fully utilized as a carrier of agricultural and other goods.

##### (3) Key Proximity to Neighbors

The Gambia is in key proximity to the larger countries of Senegal, Mali and Mauritania, Guinea-Bissau, and Guinea, the source of the Gambia River. It lies between the Casamance and the rest of Senegal close to landlocked Mali, Burkino Faso, Niger, and Mauritania. It is on the Atlantic Ocean. With further economic development, the Banjul area may have the opportunity to serve as a regional center much as Abidjan serves the countries that surround it.

##### (4) The Smallness Advantage

The Gambia is a small country. It takes approximately five to six hours to drive from Banjul to Basse,

the main center in the Upper River Division (URD), which is not quite to the easternmost end of the country. The smallness of The Gambia negates the expense of maintaining a large standing army, a costly Flag airline, and a large university. The management span is less in The Gambia than in most countries, so it may be easier to organize development. There are only six civil divisions in this geographically small country and only one major urban area which serves as the national capital and major trade center. The major transportation routes from the capital to the divisions are on and parallel to the river. This environment and the small number of units (limiting the number of subordinates to a manageable number) facilitate the management of public and private activities operating throughout the country.

(5) A Level Country

The elevation in The Gambia varies from sea level at Banjul to only 50 meters above sea level. Because The Gambia is a level country it is relatively easy and economical to build roads and other infrastructures for economic development.

b. Potential Livestock Production, Sale, and Herd Reduction

The Gambian trypanotolerant cattle, the N'Dama breed, are a national resource and in demand as breeding stock for the surrounding countries. The International Trypanotolerant Research Center (ITC) located in The Gambia and supported by several donors (FAO, ODA, EEC, ADB, GOTG, and USAID/ILCA/ILRAAD) is an asset which attracts foreign exchange. The ITC should develop findings that will be useful to Gambian farmers. The Gambia has been exporting N'Dama cattle and opportunities should expand for further exportation.

On-going research at the village level in animal nutrition, disease control, and management promises increased efficiency for production of cattle, small ruminants, and poultry. The research results suggest that the above-mentioned live-animal export expansion and the domestic meat consumption needs could be met. At the same time, the research could create a potential for reduction of the ruminant herd relative to the limited grazing resources.

c. Dense Population

The Gambia's dense population should make dissemination of new programs and projects relatively easy. According to FAO-collected data, only Nigeria has more people per square mile than The Gambia's 71 persons. (1985 data). A World Bank study reported that the effective density is 90 persons per square kilometer as about 60 percent of land in The Gambia is suitable for agriculture. Currently the Ministry of Agriculture

(MOA) estimates that there are approximately 45,000 dabada (farming units). The typical farming unit consists of 10 to 12 persons who work as a farming group.

d. Desirable Beaches Attractive for Tourists

Many miles of undeveloped beaches and a subtropical climate are attracting tourists, mostly from Europe. Tourism is an important activity generating about 7 percent of the GDP and employing about 3,000 people. In 1986/87 a record 86,000 tourists visited The Gambia. Total tourist receipts were in excess of 25 million dalasis (\$1 = D7.7). Meeting the infrastructure and food needs of the tourist appears to be a challenge for the government of The Gambia (GOTG) and an economic opportunity for Gambian farmers and food purveyors.

e. Crop Production Potentials

(1) Vegetable and Tropical Fruit Production

The Gambia possesses the soils, climate, and water to commercially produce vegetables and tropical fruits for both domestic market (especially the tourist hotels and restaurants) and for export, primarily to Europe. Advanced technology and management techniques are needed in this enterprise.

(2) Maize Production

Maize has already changed to a cash crop from a backyard garden crop. Improved seeds and fertilizer plus improved weeding practices will need to be adopted to expand maize production.

(3) Sesame Seed

Sesame seed offers a unique opportunity because it fits into the Gambian cropping pattern; it can be grown on the same land after an early maturing crop such as millet. Farmers can produce 600 kg. of sesame with the use of fertilizer. When sold, it provides additional income for the farmer and when consumed at home, sesame provides more calories and protein to the rural family, especially to the children, thereby improving nutrition. A private marketing system is in place that processes oil for village use and cake for both human and animal consumption. Some export shipments have been made by private Gambian merchants and in the future marketing efforts might be organized in conjunction with groundnut marketing.

f. Fish Production Potentials

(1) River Fisheries

The Gambia River significantly increases the abundance and variety of the fishery resources of the country. Nutrients carried from the land increase the productivity of the river and marine waters far from the river mouth. The mixture of salt and fresh water in the estuary creates one of the most productive of all ecosystems. The river provides The Gambia with a unique upriver freshwater food resource, and highly valuable estuary fishery resources (including shrimp) whose value (or potential value) exceeds that of the industrial fishery.

(2) Coastal Fishery Resources

The Gambia may be unique among coastal nations in possessing some under-exploited fishery resources. While it seems likely that some fish stocks near shore and most demersal (bottom-living) species offshore are overfished, there is evidence that other populations can sustain heavier exploitation. Catches of the coastal artisanal fishery have declined in recent years. This may be due to reduced fishing efforts resulting from poor marketing and other problems rather than declining populations of fish. The industrial pelagic (midwater) fish stocks are probably under-fished. There is evidence that the shrimp stocks can sustain higher catches. This matter requires careful study to ensure that stocks are properly conserved.

(3) Environmentally Sound Planning

Because of the stage of fishery and aquaculture development in The Gambia, the country has an opportunity to plan its development in an environmentally sound manner. Stocks that may be overfished can probably be restored with less dislocation of the participants than in some countries, and stocks that may be under-exploited can be brought to full use in a rational manner.

(4) Good Potential for Aquaculture

The country has a good opportunity to develop aquaculture. Soil characteristics, and social and other conditions in the small farmer community may delay the development of farm ponds, but the possibility of shrimp farming in the lower reaches of the river seem excellent.

g. Forestry for Fuel, Building Materials, Animal Feed, and Cropland Regeneration

Even though forestry is not addressed in the terms of reference nor represented on the team, it interacts with agriculture and livestock in many ways, both positively and negatively. Savanna woodland forest or Sudano-Guinea savanna and bush cover 46 percent of The Gambia providing fuel wood and charcoal for cooking, building materials, browse and grazing for livestock, wild animals/tourist attractions, and wild honey and regeneration of top soils for crop production. The regrowth of forest/bush on cropland is a constant problem for the farmers and demands considerable weeding expense to control. On the other hand, the demand for more cropland to meet the everyday needs of the growing population is resulting in deforestation of fallow and marginal land which encourages erosion and further ecological deterioration. Bush fires, often started by farmers, herders, and foresters for various reasonable short-term management purposes (clear debris from cropland, improve grass regrowth at an early rainy season, or burn in an early dry season to reduce forest damage of later fires) tend to limit the regrowth of non-fire-resistant trees and bushes. Less desirable fire resistant species are increasing and reportedly predominate at the present time. Excessive wood cutting for human consumption may be the most serious threat to The Gambian forest. The problems have been studied and are being addressed by the Department of Forestry with the help of several donors including USAID, GTZ, UNDP/FAO, the World Bank and the Peace Corps.

2. Unique Constraints

a. Lack of Education

The level of education is too low to take full advantage of the trading experience of the merchants and potential development of a functional free port.

b. Social Factors and the Division of Labor

The Gambian social structure can be a constraint to agricultural development. The present complex hierarchy and the division of labor between men and women may ensure the well-being of the community at the expense of significant individual advancement and large increases in agricultural production. The rural exodus to the cities and the migration of labor from nearby countries complicates labor availability and reduces agricultural labor productivity. Adoption of improved technology, such as improved seeds, fertilizer, and animal traction with appropriate implements, may increase labor productivity.

The informal leadership (village chiefs and religious leaders) should be involved and cooperate to address this constraint.

c. Adjustment to Effects of Fluctuating Rainfall

The Gambia is located at the southern edge of the Sahel and has felt the effects of the droughts in this region. The poor rains experienced in the early 1970s and early 1980s are interpreted by many knowledgeable experts as a downward trend in rainfall that might be expected to continue in the future. If this indeed is true, it may be in considerable part due to the increasing desertification outside the borders of The Gambia and beyond its control. Lowered rainfall affects agriculture in terms of the moisture available to grow crops and support grazing, and affects fisheries in terms of the size and geographical distribution of species caught. It increases the distance penetrated upriver by the salt water from the ocean, the amount of land affected by salinity, and the distance upriver of fish and invertebrates.

Statistical analysis of the rainfall data since 1964/65 is not conclusive. The calculation shows a downward trend at the rate of 4 mm per year, but the coefficient of regression is extremely low (.04) and the variation is such that the mean is nearly as good an estimate for any year as the trend (see figure 1 and table 1 which are on the following two pages.) Moreover, the trend of the most recent years is upward, and since 1986/87, the average annual rainfall has been above both the mean and the trend. A World Bank analysis of rainfall data in The Gambia from 1886 to 1980 shows a similar downward trend, but with a smaller slope of 3 mm. per year. It also shows a pattern of large annual variations in rainfall.

d. Donors and Non-Government Organizations

Many donors and non-government organizations (NGOs) are involved in Gambian development. The Gambia is a pleasant country with hospitable people and it is small enough that many donors and NGOs believe that they can make an impact. Therefore, many different aid efforts are underway. These aid projects require careful monitoring and coordination to make them effective. This is a challenge to the GOTG in order to facilitate the most effective use of foreign aid.

e. Marketing and Farm Supply Infrastructure

Marketing and farm supply infrastructure is developed unevenly. On the one hand, there is a statutory monopoly marketing board, the Gambian Agricultural Marketing Board, (GAMB) that is highly organized to carry out the transport, processing, and export of groundnuts and the marketing of some

# Annual Rainfall in The Gambia

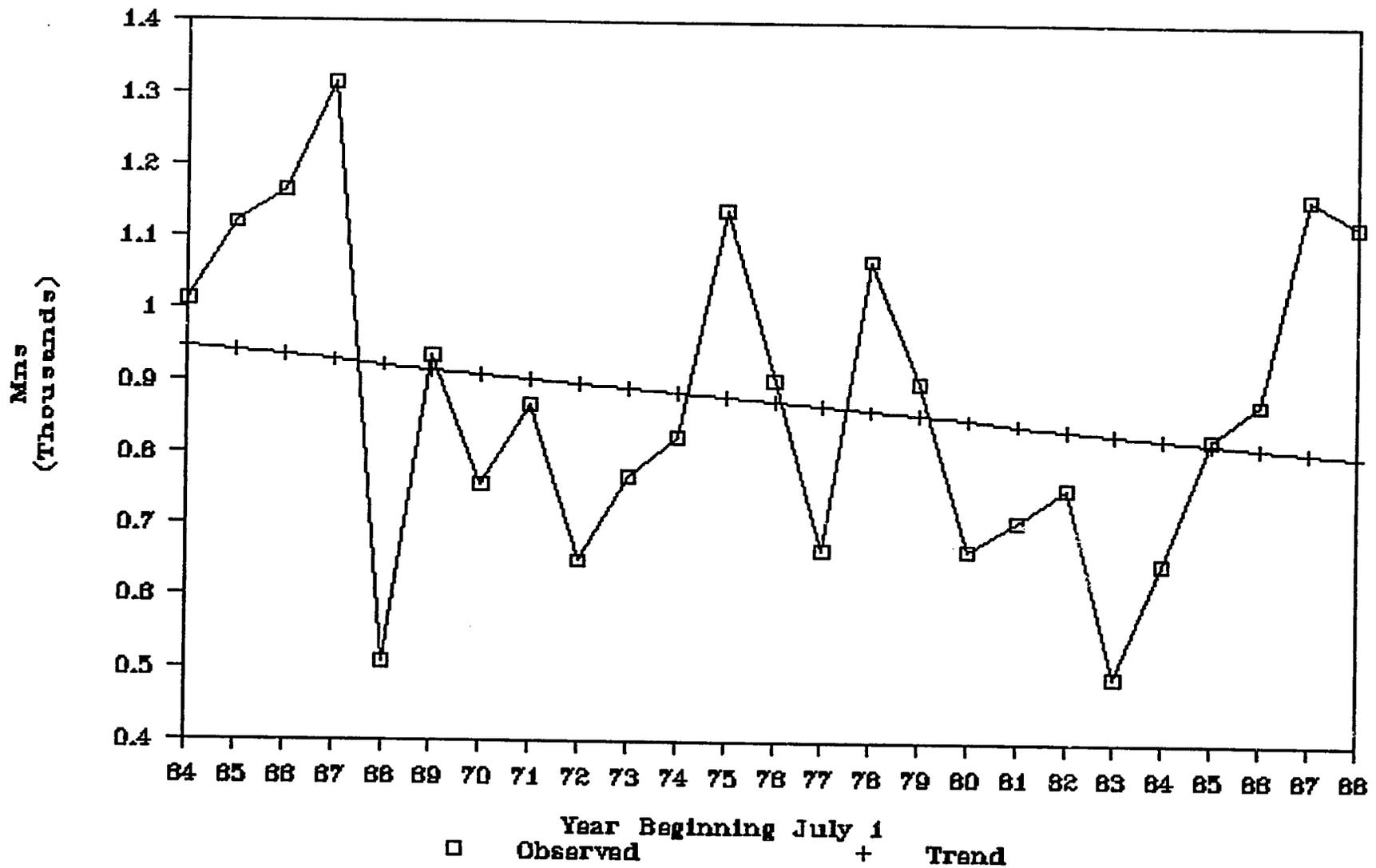


Table 1. Annual Rainfall: The Gambia, 1964/65 to 1967/89.

Year	Observed	Trend	Difference From Trend	Difference From Mean	Year Number
	Mms	Mms	Mms	Mms	
1964/65	1,011	947	64	1,011	1
1965/66	1,120	941	179	1,120	2
1966/67	1,166	935	231	1,166	3
1967/68	1,313	929	385	1,313	4
1968/69	508	923	-414	508	5
1969/70	936	916	19	936	6
1970/71	757	910	-154	757	7
1971/72	868	904	-37	868	8
1972/72	650	898	-248	650	9
1973/74	770	892	-122	770	10
1974/75	825	886	-61	825	11
1975/76	1,139	880	259	1,139	12
1976/77	904	874	30	904	13
1977/78	666	868	-202	666	14
1978/79	1,069	861	208	1,069	15
1979/80	902	855	46	902	16
1980/81	665	849	-184	665	17
1981/82	706	843	-137	706	18
1982/83	754	837	-83	754	19
1983/84	489	831	-342	489	20
1984/85	649	825	-176	649	21
1985/86	825	819	7	825	22
1986/87	873	813	60	873	23
1987/88	1,159	807	352	1,159	24
1988/89	1,120	800	320	1,120	25
Average	874				
Number of years		25			
Regression					
Constant				953	
Std Err of Y Est				219	
R Squared					.04
No. of Observations				25	
Degrees of Freedom				23	
X Coefficient(s)			-6		
Std Err of Coef.			6		

other crops. On the other hand, the informal sector is thriving. There are active village-level and trade-center markets where buyers and sellers exchange foods including cereals, meat, fish, eggs, and fresh horticultural products as well as other household items and farm supplies. Many operate weekly on an arranged day. However, there is little in the way of facilities and enterprises developed between the informal sector and the GAMB to serve the needs of the commercial farmer, except for the required cooperatives. But the cooperatives have limited product lines and are open only at selected times. Electrical service, communications, and local farm-to-market roads and bridges are inadequate. The full range of village level utilities, stores, and services needed to support optimal agricultural production remains to be developed. This includes both public infrastructure and private sector enterprises. A more positive note is that the widespread participation of rural Gambians in informal trading provides experience for emerging entrepreneurs who are needed to build a more adequate private sector.

f. Small Scale of Fisheries

The advantage to agriculture of the smallness of the country, discussed in 1.a.4 above, may be a severe constraint in the fisheries sector. The ocean area available for exclusive fishing by Gambian vessels extends out 200 miles but the most productive area is only about 30 miles wide, the width of the coastline. This provides a small ground over which trawl or purse seine vessels can work. Moreover, because of the smallness of the area, the fish stocks there are often the same as those being fished or overfished in waters of nearby countries, adversely affecting that part of the resource in Gambian waters.

g. Foreign Vessels and Fishermen

A high proportion of the vessels and fishermen operating in Gambian waters are foreign, particularly in the coastal artisanal and industrial fisheries. For example, in three of the largest fishing villages on the coast south of the river about 90 percent of the canoes are owned and manned by Senegalese. All of the vessels fishing in the industrial fishery offshore are foreign-owned, substantially reducing the benefits to the country in food supply, employment, and income.

h. Inadequate Resources for Surveillance and Law Enforcement

The Gambia has inadequate resources of money, trained manpower, and tools for the monitoring, surveillance, and enforcement of fishery laws and regulations. This is especially true of the industrial fishery but applies as well to the artisanal sector. This leaves The Gambia vulnerable to the actions of foreign nations fishing legally or illegally in the

nation's exclusive economic zone (EEZ). This inability to enforce the laws can result in fish stocks being damaged by overfishing, and greatly reduced fees and other income that should be derived from the resource.

### C. Objectives of the Study

The objectives of The Gambian agricultural diversification study were developed by USAID/Banjul in consultation with the government of The Gambia. Since independence in 1965, the GOTG has promoted agricultural diversification in order to broaden the productive base of the economy, improve and increase the foreign exchange earnings capacity of the agricultural sector, and increase rural employment opportunities and farmer and fisherman incomes.

The GOTG, with donor assistance, has initiated several programs and projects designed to achieve the diversification of the agricultural sector. Some of these efforts are as follows:

- o Irrigated rice production scheme
- o Cotton production
- o USAID mixed farming project
- o Cereals package deal program
- o Onion and other vegetable production schemes
- o Livestock development efforts
- o Fisheries

The GOTG's economic recovery program (ERP), which began in 1985 is attempting to rehabilitate agricultural production and initiate sustainable long-term economic growth. In order to ensure that current and future GOTG policies to promote agricultural diversification are sound, the GOTG is studying past experiences in diversification gain supported by public, private, and NGO's programs and projects.

This study is in harmony with the goals and purposes of USAID's Gambia agricultural research and diversification (GARD) project. These goals are to test, generate, adapt and promote the adoption of improved crop and livestock technologies that meet farmers' needs and expand and diversify The Gambia's agricultural sector. The present study will identify programs and projects that offer the most potential for further development.

Specific objectives set forth by the GOTG and USAID/Banjul include the following:

- o To evaluate the various Gambian government programs and projects aimed at diversifying the agricultural and fisheries base since 1965

- o To evaluate private sector initiatives in agricultural and fisheries diversification since 1965
- o To evaluate the experiences of foreign and indigenous non-governmental agencies in agricultural and fisheries diversification since 1965

D. Statement of Work

The statement of work as developed by USAID/Banjul and officials of GOTG require an evaluation of past public (GOTG and donors) and private (NGOs and individuals) diversification efforts. The team will develop a study that will include the following:

- o Identify and prioritize the various agricultural and fisheries diversification activities and enterprises that hold potential for economic and social viability
- o Define the various policy measures required for the promotion of the identified diversification activities and enterprises
- o Assess the budgetary implications of GOTG public policy support for agricultural diversification
- o Define a detailed plan of action program to implement the policies required
- o Define the roles of the public and private sectors, including NGOs in such a concerted action program, and suggest methods for coordinating the activities

E. Gambian Economic Policies that Impact on Agricultural Diversification

1. Free Trade Policy

The Gambia has a relatively open economy, and current policy re-emphasizes that this should be maintained. There are no arbitrary constraints on trade with the rest of the world. There is considerable cross-border traffic and re-exporting of goods to neighboring countries. In general tariffs are less in The Gambia than in Senegal. The atmosphere of free speech, support of human rights, and free trade within the country provides an environment conducive to development of productive agricultural enterprises in The Gambia.

2. Floated Dalasi

Since 1985 the Gambian currency, the dalasi, has been floated against the U.S. dollar and other international

currencies. This policy change was made as a part of the economic recovery program the country adopted to improve the performance of the economy and to meet its international obligations. While the change initially nearly doubled domestic prices, the dalasi now directly reflects international prices for agricultural exports such as groundnuts, and farm inputs such as fertilizer. This provides meaningful price signals for both public and private decision makers. Moreover, the incentive to smuggle goods and trade in black markets has been reduced. Aside from the implications for the economy in general, the policy of floating the dalasi has a major impact on the value of agricultural output and the cost of imported agricultural imports.

### 3. Commodity Pricing Policies

The pricing policy for groundnuts and staple foods on a national level in the recent past has featured guaranteed prices and efforts to stabilize prices for export crops in the face of falling international commodity prices and to provide incentives for producers of cereals. Groundnut prices to producers have reflected what was in effect an export duty on that commodity. However, the impact of this on producer prices was offset, at least in part, by transfers from GOTG funds derived from monetized food aid. With the ERP this policy has been reversed and the domestic prices have been allowed to follow world market price trends. From July 1989 the GOTG plans to cease such subsidies.

### 4. Tax Policies

The Gambia has relied heavily on import duties and implicit taxes on groundnut exports as sources of revenue for recurrent expenditures. This has made the country's revenues highly sensitive to fluctuations in international commodity prices and the volume of international trade. Moreover, the results of these taxing policies have distorted the incentives to agricultural producers and contributed to GOTG budget deficits. These policies have been modified substantially by The Gambia's economic recovery program.

Funds for economic development have come mostly from loans and grants from outside sources. There is a gap in the tax policies to generate funds for maintaining and replacing wornout capital goods that are needed to sustain long-term development of agricultural production. When export taxes are removed on agricultural commodities and import duties on farm inputs are reduced or eliminated, there must be a way to tap the gains in agricultural output brought about by improved infrastructure to repay loans, accumulate funds for additional investments, and replace the existing infrastructure when needed. For example, the

cost of a bridge across the Gambia River could be financed by tolls paid by the bridge users.

## 5. Policies to Develop Infrastructure

The policies of the GOTG recognize that rural development and increased agricultural and fisheries production require public infrastructures such as roads, bridges, schools, market facilities, electricity, and communications. Examples are the paving of the main east-west highway, improvements in the port facilities, and investments in telephone and electric utilities.

## F. Method of Approach to the Study

### 1. Review of Available Studies

Agricultural diversification has been a development goal in The Gambia for decades. Therefore, many studies, project evaluations, and proposals have been prepared over the years. This consultant team's goal is to build upon the present body of knowledge, and at the same time provide the government and USAID with a fresh and outside view of agricultural diversification efforts. In order to provide this analysis, the team has reviewed available studies and reports using the MOA's Department of Planning library, USAID's agricultural library, the British High Commission's library, international documents including those of the World Bank and FAO, the USDA's studies, and the AID libraries in Washington, D.C.

### 2. Interviews with Current Advisors

In addition to the review of documents, Gambian and expatriate advisors were interviewed. More than 130 persons were interviewed by the members of the agricultural diversification study team. The consultants traveled 1750 km up-country and spent many hours in the field (outside of Banjul). The consultants also traveled the north bank from Georgetown to Banjul.

### 3. Multidisciplinary Analysis

Four disciplines were involved in the analysis of the data collected for this report: agricultural economics (farm management and marketing), livestock production, agronomy, and fisheries.

### 4. Programs and Projects Prioritized

Prioritizing programs and projects was another step that was completed. Each program and project was studied and analyzed to determine its probability of success. This

assessment was based on the individual judgments and the outcome of the interactions among the members of the team.

## 5. Recommendations Prepared

A set of recommendations was developed on policies, programs, and projects for the further agricultural diversification of The Gambia. The impact of these policies, programs, and projects on the budget of the GOTG is also included.

## G. Irrigation Parameters

The high development cost and the long-term sustainability of irrigation parameters will be reviewed with a cautious eye. The record of problems is exemplified by the experience of the Jahally-Pacharr project. This scheme has produced an acceptable level of rice yield (6 tons per crop and 12 tons per year hectare) however, when all costs are considered, the cost of producing this rice is about three times the cost of imported rice. The likelihood of achieving a sustainable irrigation scheme appears small, without heavy government or donor subsidies and considerable foreign technical assistance. Therefore, this review of agricultural diversification will place limited emphasis on irrigation schemes.

## H. Production and Economic Challenges

### 1. Planning and Management

The planning and management of the economic development of The Gambia is a challenge to the government, the private sector, and the people of the country. The Gambia has many advantages and constraints to further agricultural diversification and economic development. The effective use of available key resources is an important element for success.

### 2. Infrastructure

While it is difficult to demonstrate large short-term effects on agricultural production from the creation of public and private infrastructure, it clearly is essential for sustained agricultural productivity as well as general improvement in the quality of life. The challenge is that a very large investment relative to the available savings and prudent borrowing power of the GOTG is needed to adequately support the development of commercial agricultural and marketing efforts. The following items illustrate the kinds of infrastructure that relate most directly to agricultural and fisheries productivity, and the efficiency of the trade sector handling agricultural products and inputs:

- o Bridges across the Gambia River
- o Electric power capacity and distribution
- o Telephone service
- o Small-scale works to control drainage and conserve soil
- o Local farm-to-market and fishery-to-market roads
- o Machinery workshops
- o Cold storage facilities at the port
- o Local financial institutions
- o Input supply enterprises
- o Storage, processing, and marketing facilities
- o Effective communications network: radio, newspapers, mail, etc.

### 3. Private Investment

The Gambia has adopted a set of investment incentives designed to attract private investors to establish productive employment-generating enterprises. Implementing this program requires the development of terms mutually acceptable to the GOTG and investors, i.e., within GOTG investment policy and yet providing sufficiently high returns to attract and retain private investors. Some of the "agribusiness opportunities" require a high degree of technical knowledge and management ability with the prospect of returns as high as some less demanding and less risky activities. For example, importing and distributing fertilizer compared with importing and distributing rice.

### 4. Price Incentives

Providing effective price incentives without subsidy for resource-limited and risk-averse producers will be a challenge. The goal is to achieve a surplus in the rural areas to supply the domestic formal market (including tourists), and to export agricultural commodities in the face of fluctuating world markets.

### 5. GOTG Staff Capability

Employing a smaller but adequately trained GOTG staff on a sustained basis is another major challenge for the government. This involves providing incentives to attract and hold competent people for the public services essential for increasing agricultural and fisheries productivity. With privatization of former government enterprises comes increased responsibility for effective regulations by the GOTG rather than direct control. In order to promote an efficiently operating private sector, the GOTG must execute its functions as maker and enforcer of regulations governing commercial activities in the private sector. Moreover, it must do so in a manner that is perceived as equitable by farmers, traders, and consumers. The government is also the logical provider of certain services to

the participants in the food and fiber sector, such as research, extension, education, and market information.

#### 6. Long-Term versus Short-Term Investments

A difficult but unavoidable challenge is to determine the optimal balance between long-term investments in physical infrastructure, research, and education, and allocation of resources to programs designed to boost output in the short term.

#### 7. Magnitude of the Task

Attaining the production increases required of the agricultural sector in The Gambia is a large undertaking. It involves keeping production level with population growth, catching up on the shortfall in production that would be needed to provide a trade surplus, and improving living standards. With a slight increase in the level of living (one percent assumed), an order-of-magnitude estimate calculation indicates that, as a minimum, an annual rate of growth of at least 4.5 to 5 percent (5 to 6 percent with an assumption of continued in-migration) is needed if the value added by projection assumes a foreign trade shortfall of approximately 240 million dalasis annually, a population growth of 2.6 to 3.5 percent annually, and one percent annual increase in the contribution to the GDP. It is not our purpose to advise the GOTG on its growth rate goals. We just want to indicate an approximate idea of the enormity of the task that will be required of agriculture in The Gambia in the near-term future. What is needed is growth in aggregate productivity at a fast rate, which is a sharp departure from the experience of the recent past.

#### I. Risk and the Diversification Effort

Any change in the agriculture sector in an effort to increase productivity involves risk. The Gambia's agriculture sector has lagged behind the nation's food requirements. Production has stagnated over the past several decades. In our opinion the leaders of The Gambia have no choice but to try to change the agriculture sector to make it more productive. In making these changes, The Gambia must accept the risks. If The Gambia does not attempt to change the production function of the agriculture sector, it must accept the situation of falling further behind in meeting its food needs and earning more foreign exchange to pay for necessary imports.

This acceptance of the risk factor has been considered in the development of policy issues and specific recommendations. The team also notes that different agriculture commodities involve different levels of risk in their production. The most widely grown cereal is millet, which is drought resistant and is considered a low risk commodity while maize, which is less

drought resistant, requires high levels of fertilization and is a higher risk crop. Traditional cattle and small ruminants herding is a low-risk enterprise, and interventions we have considered to make herding more productive are considered low risk. However, more intensive livestock enterprises such as commercial poultry production involving large amounts of imported inputs, are higher risk enterprises. The risk factors vary when considered at the farm level and at the national level. An individual farmer entering into commercial fruit and vegetable production may be increasing his risks, however, these risks at the national level may be insignificant when considered against the productivity gain in the total agriculture sector from interventions with low- and high-risk changes.

The risk factor has been carefully considered in the development of the policy issues and recommendations; therefore a mixture of low-, medium-, and high-risk enterprises have been selected.

**CHAPTER II**

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**A REVIEW OF AGRONOMIC DIVERSIFICATION PROJECTS**

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## CHAPTER II

### A REVIEW OF AGRONOMIC DIVERSIFICATION PROJECTS

#### A. Farming in The Gambia

##### 1. Farm Resources - Land, Climate, Soil

The Gambia is only 325 km. long and varies in width from about 12 km. to 48 km. The total land area is 10,690 square km. of which nearly 20 percent is covered by the river and associated swamps. The country is extremely flat with the highest elevation in the eastern end of the country rising only to between 40 and 50 meters. The river is tidal throughout its length. There is considerable intrusion of salt water ranging from 150 km. during the wet season to nearly 250 km. during the dry season. There are three distinct geographical areas: a belt of mangrove along both sides of the river for a distance of nearly 250 km., a narrow strip of slightly higher ground running most of the length of the river that becomes swamp during the rainy season, and a band of upland sandstone which forms a plateau reaching to the border with Senegal.

The weather pattern is one of a short rainy season (May-June to September-October) followed by a long dry season. Rainfall ranges from an annual mean of nearly 1200 mm. in the the west to 850 mm. at Sapu, which is located in the north bulge at the mid-point of the country. However, rainfall can vary widely from year to year and The Gambia is subjected to periodic droughts. In the wet season, the temperature averages 27 degrees centigrade and the relative humidity is 80 percent. In the dry season, the temperature get up to 36 degrees centigrade and relative humidity drops to 50 percent. There is frequently a dry wind from the desert (the "harmattan"), which causes the rapid drying out of the soil after the rains.

Land use patterns are determined by distance from the village and distribution of suitable soils. A rough classification into plateau, colluvial, and alluvial soils can be made. Progress from one to the other being made as one approaches the river. The older established villages tend to be on the colluvium with maize, vegetable, groundnut, millet, and sorghum plots found in proximity to the village. The less fertile plateau soils will also be used for groundnuts, millet, and sorghum and the lower plateau for findo (*digitaria exilis*) and upland rice. The alluvial soils, where salinity permits, will be used for rice and dry season grazing for cattle.

##### 2. Major Crops Grown

The land allocation among the principal crops in The Gambia in 1988/1989 reflects a long-standing cropping pattern

whereby groundnut is the most important crop. Groundnuts are followed by the course grains (millet, maize, and sorghum) and by swamp and upland rice.

Table 2. Allocation of Crops

<u>Crop</u>	<u>Percent of Cropped Area</u>
Groundnuts	52
Millet	17
Maize	11
Sorghum	12
Rice (upland and swamp)	12

In addition to the above crops, it is estimated that 12,000 hectares of sesame were planted last year. Vegetable gardens and findo and cotton plots account for the remainder of the cropped area.

### 3. The Farming Unit

The rural population generally resides in villages. Very few families live alone on, or near their land. Within a village, population clusters by family units, each of which is likely to live in a small group of buildings. These family units are a group of persons who are related by kinship or affinity (usually marriage).

These family groups, especially the older established groups, may have three generations represented. These family units, referred to as compounds may be considered a production-consumption unit. The senior male in the compound is the compound head. The senior wife may also participate in the decision-making process. An unrelated farm laborer (strange farmer), or a young boy interned as a Koronic student may also reside in a compound.

The National Agricultural Survey has identified 45,000 dabadas in The Gambia as the population from which they draw their annual sample to make agricultural production estimates. Dabada is a Mandinka word describing a sub-division of a compound (in most cases, it is the entire compound). It is a semi-autonomous work group within the larger family structure, controlling it's own farm labor and having some degree of control over it's financial affairs.

#### 4. Characteristics of a Typical Farm

According to The Gambian Mixed Farming and Resource Management Project Technical Report No. 10, the typical farm can be generalized as follows:

- o Between 2 and 8 hectares
- o Between 5 and 20 adult equivalents
- o Between 4 and 13 small stocks
- o Between 4 and 15 cattle
- o Between 1 and 2 draft animals

#### 5. Typical Farm Definition

For the purpose of this analysis, the target farm is defined as follows:

- o 4.2 hectares of land in cultivation
- o 12 adult equivalents of labor
- o 8 small stock
- o 10 cattle
- o 2 draft animals

#### B. Interventions to Support Institutions that Impact upon Agriculture

A review of the agricultural research and extension institutions and some of the changes to these organizations in recent years is appropriate. Both of these institutions, agricultural research and extension departments, are a part of the Ministry of Agriculture. As a result of the economic reform program, a retrenchment has taken place in MOA and the number of positions in MOA has been reduced from 2300 to 996 positions. Considerable realignment of units within the MOA has also taken place. These include the following:

- o Research and extension has been placed into separate departments.
- o The Department of Crop Protection Service has been placed in the Department of Agricultural Services (Extension).

It is a credit to MOA leadership that there is no loss in it's ability to function, according to many observers. Prior to the retrenchment the MOA had many village-level workers with little or no training in agriculture. These untrained workers account for the positions that were eliminated. A discussion of the Departments of Research and Extention follows.

## 1. Department of Agricultural Research

The Department of Agricultural Research was reported to have 16 professional research staff in 1984 and in 1989 there are 15 researchers in stations at Sapou and Yundum. However, in June of 1989, the department reported that several employees are in training abroad on degree programs (B.S. and M.S.) who are sponsored by USAID, FAO, and the British Government.

The lack of strong liaison between research and extension was reported to be a problem in 1984. It is often stated as a problem today.

Observers report that linkages with the international agricultural research centers are poor. Interaction may be difficult because the staff is small and the number of advanced degrees is low. It may also be difficult because of inadequate attention from the international centers.

## 2. Department of Agricultural Services (Extension)

This department was created in 1987 as a result of separating research and extension functions in the Ministry of Agriculture. The crop protection services are also to be folded into this department, however, it has been reported that this merger has not yet been completed.

In 1984, it was reported that 70 percent of the budget was devoted to salaries of staff. This same percentage is reported today despite the major retrenchment exercise in the MOA.

Since the separation of research and extension functions, it has been reported that cooperation and linkage between research and extension has diminished.

The Director of Agricultural Services reported that there are 440 employees in the Department of Agricultural Services. Of this number, there are 4 employees with M.S. degrees, 8 with B.S. degrees, 15 with diplomas, and 150 with certificates.

The director of agricultural services also reported that the extension services' two major constraints were the lack of mobility for field workers and the lack of a valid message to extend to farmers.

It was reported that NGOs are hiring away some of the better field agents. The problem of the lack of institutionalization of NGO efforts was also noted, i.e., responsibility for this work when the NGO leaves.

C. Past and Present Programs to Develop Agronomic Diversification Activities

1. Cereals Package Deal Program

The cereal package deal program was launched by the DOA in 1977. It was designed to show farmers that higher yields could be obtained from their fields by the adoption of improved crop husbandry practices. Demonstrations on sorghum, millet, maize, and rainfed rice were made in each of the 35 districts of the country. For the first season, fertilizer, insecticides, and seeds were provided to the farmer free of charge. The farmer is supervised by his extension agent. The entire program was financed by the GOTG.

The full impact of the program has not been evaluated by DOA. DOA reports indicate that "whilst it is difficult to call it a failure, it cannot be objectively called a success. In many cases yield targets that have been set for each crop have not been achieved at either the district or national level. Yields have gone up but not as expected."

The following were listed as constraints against the achievement of project objectives:

- o Absence of improved varieties capable of higher production than local varieties. Maize and upland rice were the exceptions as improved varieties of these crops were available.
- o Inadequate manuring of fields with farm yard manure.
- o Inadequate use of fertilizers as farmers were afraid of being buried in debt.
- o Lack of improved farm implements.
- o Poor crop husbandry practices: late planting and poor weeding operations.
- o Poor communication between extension and farmers as immobility of extension workers was a problem.
- o Absence of an organized grain market.

2. Programs in Rice

a. Colonial Development Corporation Farm/CDC, 1951-1956

The initial attempt to develop the Jahally Pacharr swamps totalling about 2160 ha. was made in the 1950s by CDC. The

scheme was abandoned because of poor engineering design and lack of suitable rice varieties.

b. Taiwanese Agricultural Mission, 1966-1974

The Mission introduced small-scale mechanization schemes for irrigation in the MacCarthy Island Division (MID) and Upper River Division (URD). The scheme developed approximately 1000 ha. of irrigated land, introduced new rice varieties, organized growers in cooperatives through which inputs were channeled, and provided free start-up services to farmers.

The impact of the program was severely constrained by failure to establish intensive double-cropping and improved seed and water control methods; farmer's lack of familiarity with machines; and lack of appropriate indigenous mechanical skills and agricultural workers. The scheme was terminated eight years later because of changes in The Gambia's foreign relations with Taiwan. The mission from the People's Republic of China now controls the project.

c. World Bank Agricultural Development Project/ADP, 1973-1976

Encouraged by the Taiwanese initiative, the GOTG reaffirmed its commitment to pursuing a policy of self-sufficiency in rice production by concluding a project loan with the World Bank for reclamation of 1200 ha. of irrigated rice in the MID. The scheme succeeded in reclaiming between 580-700 ha. in three years.

The project was established along the lines of the Taiwanese initiative with a slight modification in terms of introducing a credit element into the system. Production inputs were extended on a credit basis to farmers.

Constraints to project objectives included inappropriate management system and inadequate extension strategies. The project initiated a commercialization process in irrigated rice production without any concomitant attitudinal change. It was terminated in 1976 leaving a huge backlog of debts.

d. People's Republic of China/PRC Rice Project, 1975-1979

The GOTG's conviction of the correctness of its policy of self-sufficiency in rice production resulted in the commissioning of a sectoral program jointly financed by the G.C.B. and the PRC under the title "Irrigated and Swamp Rice Project" with the basic objective of expanding irrigated rice by about 1100 ha. in both the MID and URD.

The project fulfilled its land development objective; increased the mechanical stock of pumps, power tillers and threshers; and introduced the following: motorized threshers, transplanters, and 4-wheel-drive small tractors. These implements have greatly changed the technological structure of irrigated rice production and precipitated thinking in terms of alternative options to the two-wheel Asian type power tillers. The project also made an impact on local mechanical skills by offering on-the-job training for local mechanics and assisting in the training of a contingent of local blacksmiths.

e. Jahally Pacharr Smallholder Project/JPSP, 1982-1989

The stated objectives of the JPSP are "...to increase rice production, initiate the development of water development and management institutions, and improve incomes of farm families in the approximately 40 villages in the project area. Financed by IFAD, the government of the Netherlands (GOTN), Kreditanstalt für Wiederaufbau (KfW), and the African Development Bank (AfDB), project implementation began at the end of 1982 and the closing date was set at June 1988. The deadline was extended to June 1989, through the financing of a consolidation phase.

JPSP was to develop a total area of 1510 ha. in the two swamps of Jahally and Pacharr for improved rice production under pump irrigation (560 ha), and tidal irrigation and rainfed conditions (950 ha). Project components included inputs and equipment provision on credit and a number of pilot social programs like the creation of day care centers for children of women farmers.

Development of the pump-irrigated area was completed in 1984, totalling 544 ha. As of March 1988, only 637 ha. of the tidal and rainfed areas were ready for cultivation. Project management plans are to complete the development of an additional area of 314 ha. for cultivating in the wet season of 1989.

Production results: Double cropping is practiced on about 75 percent of the total area so far developed. The yields in the pump area and the tidal double cropped area are 5 tons/ha. in the wet season and 6 tons/ha. in the dry season. In the single cropped area, the yield is 2.5 tons to 3 tons per ha.; in the rainfed area, the yield is 800 kg. to 1 ton/ha.

Irrigation services and mechanization: The JPSP has the responsibility for providing mechanical services for land cultivation and organizing the supply of water for both pumped and tidal areas. Mechanical services provided to farmers are for plowing, puddling, and occasional land levelling.

The use of crawler tractors for land cultivation is expensive and the resulting higher operating costs to be passed on to the farmers are unlikely to be sustainable after land development is over. Because of limited time and the competition for the machines, the land cultivation work for farmers has not always been carried out as required. This has led to some areas not being cropped and complaints from farmers who would have attempted to prepare the land themselves using other means if they had been informed that the mechanical cultivation would not be done.

Input supply: The basic inputs for rice production (apart from water and mechanical services that are provided by the project, and labor that is provided by the farmers) are supplied by GCU and by a limited number of private traders. GCU supplies fertilizer, seeds, transplanting ropes, and, on a returnable basis, burlap bags for paddy.

During the first four cropping seasons of the JPSP, the use of fertilizer from the GCU was very high, almost 100 percent of the amounts recommended by project management. Thereafter, fertilizer was still available from GCU, but the farmers were taking less because (1) they have been purchasing from private traders due to a poor credit rating with GCU or a better deal from the traders; or because (2) some farmers are failing to apply the project-recommended rate, due to inability to purchase it or to inability to realize a higher return as a result of applying it in the previous seasons.

In the past, most farmers have stored their own seed requirements, following the initial provision of improved seed by GCU. Under JPSP, contract growers are being encouraged to multiply seed.

Credit: GCU was made the institutional source of credit to the project farmers. It was also made responsible for collecting land preparation and water charges on behalf of the project. Jahally's repayment performance on credit and charges was estimated at 97 percent and Pacharr's at 83 percent over the period from project conception to 1986. It is unlikely that 100 percent repayment will ever be realized.

There are a few alternative sources of credit open to the JPSP farmers, but a pilot study is being implemented in a few of the project villages to assess the feasibility of setting up a village banking system. Based on a revolving fund, the system would meet villagers' needs for short-term credit and control would be exercised at the village level. Similar schemes are in the early stages of implementation by various NGOs in The Gambia, so far with some success, and there appears to be a high level of interest in such a scheme in the project villages.

f. Soil and Water Management Project, 1978-1991

The Soil and Water Management Unit (SWMU) with assistance from USAID has been constructing water retention and anti-salinity dikes for improved water control in transitional and rainfed rice growing areas. Since construction of these works started in 1984, the SWMU has improved a total of 1086 ha. of land, 381 ha. of which are rainfed and saline-affected ricelands, and 705 ha. of upland. These water retention structures have proven extremely effective in increasing rice yields and reducing risks in traditional rice production. Also, in some specific cases of farming areas reclaimed by salt-occluding dike, large quantities of rice were grown for the first time since these areas had been abandoned by farmers ten or more years ago.

These dramatic increases in rice production (reportedly about two-fold) have been achieved in rainfed rice areas with relatively low capital inputs through this self-help, collaborative method of installing soil and water conservation structures. These structures can be satisfactorily and inexpensively maintained by the farmers themselves.

The success of this project has been attributed to: (1) interventions that require minimum amounts of capital; (2) conformity to existing farming systems; (3) structures relatively inexpensive to maintain; (4) social acceptance and recognition by the rural population; and (5) use of self-help, non-paid labor. Also, SWMU has a strong extension component that has enhanced the projects' effectiveness and aided farmers in adopting the technology along with a package of improved crop husbandry practices.

g. Rainfed Rice Improvement Project, 1984-1992

The German Agency for Technical Cooperation (GTZ) in cooperation with the Department of Water Resources (DWR) has been constructing antisalinity dikes and contour bunding for improved water control in transitional and rainfed rice-growing areas in the western division. Since 1984, approximately 125 ha. have been placed behind dikes. An extension agronomist works with rice farmers to ensure full benefits are derived from newly developed land.

The GTZ 1987 report indicated that through the improvement of water management practices in the pilot areas, rice yields have been increased. However, the yield survey of 1986 could not prove this for the following reasons: (1) a single survey is not representative as changes in annual rainfall and spacial distribution of the rains were not taken into account; (2) before and after project stages were not compared; (3) non-project and project areas are not directly comparable because of the

possibility of differences in water availability for rice cultivation; and (4) no baseline yield data for comparison.

The GTZ report further indicated that yields have been secured and increased in 6 out of 12 villages where project activities have been implemented and completed. At two sites the antisalinity dikes had been damaged by floods due to: high levels of water, inadequate operation of the sluice gates by the farmers, and poor construction.

h. Irrigated Rice Development Program/IRDP, 1985-1989

In 1985 the GOTG created the IRDP, an autonomous project unit within the MOA intended to link the irrigated rice extension and mechanization services of MOA more effectively with the existing cooperative and marketing institutions.

The IRDP lacked a special budget and is unable to undertake any development or improvement measures on irrigated or non-irrigated rice areas without funding support.

i. Rice Development Project/RDP, 1989-1994

The primary objective of this African Development Bank-funded project is to increase rice production through the rehabilitation of the numerous deteriorating rice irrigation perimeters which were initiated by various programs in the 1960s and 1970s and through the development of 400 ha. of rainfed rice swamps in the MID.

The RDP would take over the existing irrigated rice development program that presently services 2400 ha. of irrigated rice perimeters. In the five-year program of the project (starting in 1989), it would fully rehabilitate 850 ha. of the irrigated rice schemes and improve 400 ha. of rainfed rice swamps benefiting some 25,000 persons. The project components to be funded are project management, technical assistance and training, land development, vehicles and tools, and input financing.

The estimated monetary costs in donor-assisted irrigated rice development schemes are: Colonial Development Farm - 300,000 pounds (grant by the British Government); Taiwanese Agricultural Mission (no figures available, capital costs borne by the Taiwanese); Agricultural Development Project - 1.5 million U.S. dollars (loan from the World Bank); Peoples' Republic of China Rice Development Project (no figures available, capital costs borne by the PRC); Jahally Pacharr Smallholder Project - 16.5 million U.S. dollars (loan from IFAD, ADB); Rice Development Project - FUA 5.21 million (loan from ADB).

j. NGO Rice Programs

Freedom from Hunger Campaign (Dutch) has constructed bridges, causeways, and footpaths on over 7,000 ha. to improve access to tidal swamps for rice farmers. In addition, the production research program of the FFHC has identified and distributed rice varieties, which are high-yielding, early-maturing, drought-resistant, and salt-tolerant. In the freshwater tidal zone, experiments with double and ratoon cropping have also showed promising results. Between 1983 and 1984, FFHC distributed 248.6 tons of rainfed rice seed to 11,300 farmers. Since that time, a seed multiplication program has released more than 400 tons of improved seed.

Other NGOs actively involved in rice programs include Action Aid (British) and Save the Children (U.S.).

k. Rice Research Program

The Department of Agricultural Research rice research program conducts research on the different problems in the five ecosystems of the Gambia: upland rice, hydromorphic (Bantafaro) rice, deep flooded swamp rice, mangrove swamp rice, and irrigated rice.

The major activities of the program are to screen varieties (selecting those with high yields) and to develop appropriate production techniques for rice growing in the different ecosystems.

Rice research represents the most important showpiece of The Gambia's research system. It is the crop for which the greatest number of varieties have been produced, to fit all of the different ecologies where rice is grown. The potential for improved hectares of upland rice cultivation is greater than ever with high-performing varieties such as Peking.

More recently DAR, in conjunction with the GARD project, has begun a research effort in western Gambia to develop a management package appropriate for women growing rice in transitional and rainfed rice growing areas.

Research continues in the area of nitrogen efficiency, evaluation of hand-pushed weeders, and the testing of existing and new animal-drawn equipment appropriate for flooded conditions. Results from these endeavors should move to the farmer-managed stage next year.

3. Programs in Cotton

Several cotton varieties have been introduced from the West Indies in 1956 but neither the experimental cotton nor an

extension trial of it were successful. The Nigerian varieties introduced in 1965 were more successful.

An experimental program and a pilot extension project undertaken by the DOA have shown that it is technically feasible to grow cotton in The Gambia and that the crop is acceptable to farmers. The pilot extension program was undertaken in URD and since 1969 to 1974 the cultivated area hectarage has risen from 11 ha. to 405 ha. During the initial years of the project all seed cotton was bought for 27.5 bututs/kg. but in 1973 grading was introduced with the results that stained cotton obtained only half the price of clean. Available ginnery facilities were adequate for the period of the project, but the acceptance of cotton as a suitable crop for diversifying the country's agriculture created an immediate need for a modern ginnery. It was constructed at Basse in 1976 with the aid of a loan from the African Development Bank and technical assistance from France (Caisse Centrale). To make such a ginnery economically feasible, it was necessary to increase production as quickly as possible.

The first cotton project was launched in 1975, and for five years an attempt was made to increase cotton production in the URD and MID. Although the project goals were not achieved in terms of productivity, the project did make it possible to determine that cotton was compatible with the farming systems and also made it possible to modernize and increase ginning capacity (10,000 tons/year).

In order to evaluate the results of the project, comparisons were made between The Gambia cotton project and the Senegal cotton project. The comparison showed that the yield-per-hectare in Senegal was 1452 kg. while the yield in The Gambia was 873 kg. The following reasons were given for the poor performance in The Gambia: the newness of growing cotton; the farmers' perceptions of cotton as a low-priority crop (after food crops and groundnuts in importance); groundnuts are less labor intensive than cotton; cotton requires additional applications of weedkillers and insecticides; and lack of motivation of poorly paid personnel and often inoperable transport. The evaluation report also indicated that the first cotton project was too limited because it involved developing cotton as a single crop instead of looking at it as a part of a farming system.

#### 4. Programs in Maize

Maize is not a new crop to The Gambia. It has been grown for many years as a backyard or garden crop. Also it has been a principal cereal food crop for Serahules, the largest ethnic group of the URD. However, increased interest in production of maize developed in 1977 when the DOA introduced a

cereal package deal program. Maize was included as a national crop with export potential.

More recently, USAID supported the Gambian mixed farming and resource management project/MFP, 1981-1986, which promoted the increase production of maize as a grain crop for human consumption and maize stover as a dry season livestock feed. Specifically, this was to be accomplished by the following: (1) developing a package of improved production practices; (2) collaborating with local agronomists in maize cultivation testing; (3) collaborating with the ministry seed multiplication officer in seed increase programs for suitable high-yield maize varieties; and (4) demonstrating potential of maize for human consumption and residual stover for livestock feed by assisting in training of extension personnel in delivery of the technological package to farmers.

The MFP maize agronomist arrived in The Gambia in June 1981 just at the start of the rainy season. Two varieties of yellow maize had been tested previously for a number of years on experiment stations at Yundum and Sapu. NCB was selected as the most promising variety and further testing at the experiment stations and two mixed farming centers was carried out in 1981. Results from these trials were later to form part of the maize production technology package finally adopted by the DOA Extension Service maize farmers.

The maize package was composed of several improved farm management practices designed to increase maize yields. Training seminars were held for extensionists concerning maize technology. Within their areas of responsibility, extensionists selected 156 farmers to produce maize in a 1982 introductory program. The 156 farmers represented 65 villages and planted 91 ha. of maize. Many farmers harvested more than three tons per ha.; the average was approximately 2.5 tons. Some seed planted in 1982 was of foundation quality from which certified seed could be grown. Twenty-two tons were purchased by the GCU for seed to be used in the 1983 national maize program.

Farmers were impressed with results of the 1982 maize demonstrations. In 1983 there were 3,425 farmers from 299 villages who wanted to grow over 4,200 ha. of maize. Because of a credit worthiness problem, the actual number of farmers provided credit to grow maize ultimately was reduced to 3,257. They represented 216 villages and 2,987 ha. However, delay in fertilizer delivery by as much as 30 days caused farmers to have to adjust their plans and only 2,500 ha. were finally planted.

The 1983 maize harvest was poor due to severe drought during August and September. Average yield was around 1.5 tons per ha. However, other crops also had poor yields which caused increased prices on the limited supply of all cereals. Maize at harvest

sold on the open market for D 62.50 per 100-kg. bag. By the end of the year, the price was D 80 and by June 1, 1984, prices had risen to D 130 per 100-kg. bag. These prices were impressive to farmers and a large demand for seed to increase maize production in 1984 developed. Maize was rapidly shifting from a small backyard crop to commercial production.

The maize production program proved to be highly successful. More farmers planted maize and the hectares planted increased from 6,900 in 1983/84 to 9,200 in 1984/85, and to 16,600 in 1985/86. Farmers were quick to realize maize was a fast maturing crop, required less labor to produce, stored well, and was a good alternative cash crop. Yields of 2 to 2.5 tons were common and there was a ready free market with higher prices than those being offered by the GCU.

During the life of the project, over 300 agricultural assistants (AAs) and agricultural demonstrators (ADs) were provided training on how to deliver the maize technology to farmers. MFP cooperated with FAO to conduct numerous field days where farmers were brought to view maize trials both with and without recommended levels of fertilization. In the final two years of the project, training efforts were directed largely towards farmers.

With the rapid expansion in maize production, providing Gambian farmers with adequate quality seed has been a serious problem. An attempt to raise maize for seed and carry out intercropping trials was made in 1985 in the Yundum area using sprinkler irrigation during the dry season. An agreement was reached with a group of farmers to provide water from their wells and water storage systems. Although some seed was produced, this trial was a physical and economic failure due to fuel shortages, pump breakdowns, an inadequate water supply, and reluctance on the part of the farmers to live up to their commitments. Quality seed production in adequate amounts for all varieties of crops continues to be a serious impediment to increasing agricultural production in The Gambia.

The MFP project was instrumental in getting farmers to form regional and national maize growers associations. These associations have the potential of assisting farmers in obtaining fertilizers and seed and in working with the government to set higher floor prices for maize. Over 4,000 farmers have become members of the associations.

One important component of the MFP integrated program package was a fertilizer revolving fund scheme or kafo credit scheme. Credit repayment by the kafos proved to be a problem. Repayment varied by kafos ranging from 0 to 74 percent with an average collection rate of 31 percent.

The project was completed September 30, 1986. The final external evaluation of the project indicated that the project was instrumental in raising the production/productivity and preparation of maize in The Gambia, thereby increasing and diversifying food crop production. It developed and refined technology of experimentation with and extension to farmers and producer organizations, and it established innovative production techniques in mixed farming.

After the project was completed, hectareage planted to maize decreased from 16,600 ha. in 1985/86 to 11,100 ha. in 1986/87. The hectareage increased again to 13,000 in 1987/88 and to 13,600 ha. in 1988/89.

Maize research is currently included in the Upland cereals program, which focuses mainly on the screening of varieties. Varietal screening will continue, but on a significantly reduced scale relative to a few years ago when it was perhaps the dominant element in the research program. Suitable varieties of maize were identified and successfully promoted by the MFP. Under the GARD project, support will be provided to a Gambian researcher to carry out a study of maize genotypes and environmental interactions in The Gambia.

## 5. Programs in Sesame

### a. Early Attempts to Produce Sesame in The Gambia

Following a series of cultivar trials which started in 1925, a scheme was started in 1929 to replace groundnuts as an export crop with sesame. In addition to diversifying the economy it was also argued that sesame was insensitive to season and could therefore be used as a catch crop after an early cereal and that, if sown thickly, it would not require weeding. The project was short-lived and was abandoned because of the collapse of the market (in France). A limited experimental program was carried out between 1956 and 1968, but the highest yield recorded was 436 kg/ha.

### b. CRS Sesame Promotion Program

The Catholic Relief Service (CRS) sesame program's beginnings could be traced back to 1979 when CRS started looking for alternatives to increase caloric intake and improve family nutrition in rural areas.

Initially, both sunflower and sesame were considered as possibilities. Four sesame varieties were obtained by CRS from the Sudan (2), Nicaragua (1), and the U.S. (1). Trials were simultaneously conducted by DOA at Sapu and Yundum for two years. The sunflower crop competed with traditional crops and had many other problems, including pollination (not enough bees) and head

rot. Sesame fitted the farming system fairly well; it could be sown last on poor soils and did not compete with other crops. Traditional beliefs also favored sesame. However, there was no indigenous capacity to extract oil efficiently. The local method of oil extracting recovered only about 50 percent of the oil content. (Sesame oil's content is 50-55 percent of the seed weight.)

In 1983 in CRS villages, 30 ha. of sesame were promoted yielding an average of 400 kg/ha. By 1986, areas under sesame had grown to 12,000 ha. This dropped to 5,000 ha. in 1987. Estimated area planted to sesame in 1988/89 is 12,000 ha. Seventy-five percent of those involved in production were female farmers. The male farmers involved saw that cash returns were possible. At this point, oil extraction capacity (including organization) and marketing became a primary concern.

Between 1985 and 1986, 16 oil expellers were installed. There were two types: 80-100 kg./hr and 40-50 kg./hr. Yields of 400-1000 kg./ha. have been recorded depending on whether or not manures and fertilizer were used. Up to 1,200 ha. have been reported as fertilized.

Present cultural practices for sesame include seeding with 1-2 kg. of seeds per ha., thinning out, fertilizing with 200 kilos of compound fertilizer, one weeding, harvesting by hand-cut stalks, shucking, drying, and threshing.

With the promotion and large-scale adoption of sesame cultivation, processing and marketing begin to emerge as constraints. There is a problem of marketing dark seeds; they do not meet the standards for confectionary type. Mixtures of dark- and light-colored seeds is a problem. Processing seems to be not so much a question of oil expelling capacity but of even product flow adjustments to machine sites over a period of time, thus avoiding extreme peaks.

There is a good demand for sesame oil. Sudan, an exporter of sesame, is experiencing a drop in production because of drought and civil war. The price is now relatively high. The current farm gate price is 2D/kg. Prices at 8D/liter are competitive with imported oil. To create an even flow to expelling centers, plans are under consideration to develop private/cooperative means of purchasing during the market season and storing the sesame. Attempts are also underway to develop export opportunities. This would help keep domestic prices at attractive levels and contribute to the foreign exchange earnings of The Gambia. Questions concerning policy, marketing, and investment are being addressed.

Another phase of CRS activities is management training. It has funded through 1992 a program to assist in strengthening the Sesame Growers Association.

DAR/GARD is collaborating with CRS in the screening of seed varieties which avoid the processing bottlenecks and fetch better prices. A French and a Russian sesame seed variety have been found to exhibit promising characteristics.

## 6. Programs in Horticulture

### a. Small Farmers Schemes

Horticultural crop production is concentrated in the western division and is dominated by female growers on small plots (100 square meters). The main fruits produced are citrus (oranges and limes), mangos, and papayas. Vegetable production is presently limited to the dry season (October to May), when land and labor are not in great demand for the production of groundnuts and cereal crops. The main vegetable crops grown are onions, lettuce, cabbage, and peppers.

Prior to the 1950s, vegetable production was characterized by the small plot grown primarily for "compound" consumption. Cooperative vegetable growing has been actively encouraged by The Gambian government since the 1950s with varying degrees of success. One of the first attempts was established in Sere Kunda in 1951/1952 with thirty farmers participating. It failed because the quantity and quality of the produce was no better than that produced by independent growers. There were also "trading" difficulties and the scheme lacked adequate supervision and the support from the growers.

The Gambian Department of Agriculture continued to encourage vegetable production and in 1971 established a pilot project to determine the feasibility of growing onions in grower cooperative organizations. Sites were selected and, where appropriate, fenced with each member being allocated ten beds of 6 square meters each. Members contributed to a central fund, controlled by an elected president, which was used to purchase inputs and dig wells. Seeds and technical advisers were provided by the DOA. The results were encouraging and by 1972/73, a further 20 schemes with 903 members had been established. The Freedom from Hunger Campaign (Netherlands), through a joint agreement with The Gambian government, provided a further US\$54,000 for collective onion-growing schemes. The funds were used for tools, equipment, fertilizers, and bags for marketing the produce with the DOA providing a technical adviser/demonstrator for each scheme. The stated objectives of these schemes were to reduce imports of onions, provide an opportunity to diversify from groundnuts, and to improve the diet and income of indigenous farmers. The number of schemes increased to 76 in 1976/1977 with a membership of

3,386, but this declined slightly to 71 by 1978/1979 although membership increased to 4,405. By 1981 it was apparent that the progress of these schemes was limited by such factors as shortages of seeds, drought and inadequate irrigation facilities, low prices, and inadequate marketing facilities even though the number of schemes had more than doubled.

Cooperative marketing of horticultural produce in The Gambia has also been a relatively recent government initiative. In 1973, and in response to growers' pleas for help, the DOA involved the GCU in buying onions produced in the collective onion-growing schemes. This was unsuccessful because local traders were not kept informed of these activities and imports were still permitted so that the onions were distributed through already over-supplied markets. There were considerable storage losses and a hastily arranged export scheme failed. To ensure success in any future marketing developments, it became apparent that the developers should assess the real needs, problems, and character of the local growers and market channels.

It is difficult to find figures on the number of hectares cultivated by women and their production rates. While not quantified, this production appears to be increasing rapidly as more donors and NGOs become involved in developing this activity and as women become better horticulturists. Most of the produce grown by women serves the village and urban markets of The Gambia and a small amount is exported to Senegal.

#### b. Commercial Horticultural Farms

In contrast to the small farmer schemes, there are a few large scale privately-owned commercial farms (five to seventy-five ha) situated exclusively in the western part of the country. About 466.5 ha have been developed in the past ten years. In most instances these farms produce both fruits and vegetables and some of them export the produce to the U.K. and other countries. While few figures exist on the national level, one commercial grower, Radville Farms, reported production levels of fifty tons per week in the peak season.

#### c. Horticultural Research Program

The horticultural research program was initiated in 1976 (with local funding) with the mandate to develop appropriate production techniques for the major horticultural crops, both domestic and imported; to help farmers increase their productivity. The program includes a broad range of commodities including root and tuber crops; as well as vegetables and fruits. The following projects are included under the program: varietal screening and selection; cultural agronomy; irrigation and water use; and agronomy of root and tuber crops (mainly cassava and sweet potatoes). The program has links with the Asian Vegetable

Research and Development Center (AVDRC) and IITA (for cassava and sweet potato).

Staffing problems have seriously limited the scope of the program in recent years, but the return of one graduate from degree training and another from a year-long special program this year will greatly increase capacity. In addition, the GARD project will provide the services of a research associate who will focus primarily on external networking and research/extension linkages for horticultural crops.

Special emphasis this year is being given to cassava and sweet potatoes, both of which are appreciated by customers, but currently have minor importance. Trial programs to test selected marketing interventions will be initiated in collaboration with various NGOs with horticultural projects.

d. NGO Horticultural Programs

Various NGOs including Save the Children, Action Aid, Catholic Relief Service, and the African Methodist Mission have well established extension programs for horticultural crops. Methodist Mission is based in Brikama and has been working with mango trees and dry season vegetable gardens. Action Aid is working with dry season vegetable gardening in the LRD and URD.

e. USAID/MOA Special Studies on Horticulture

The GARD project in collaboration with the MOA has conducted the following special studies on horticulture in The Gambia.

- o Survey to identify horticultural research priorities in The Gambia
- o Review of horticultural trials and evaluation of research capability of horticulture unit
- o Horticultural marketing research proposal
- o Horticulture research station management
- o Horticultural marketing research report

7. Programs in Millet and Sorghum

Millet is the most important cereal in terms of area and production. Sorghum has fallen behind rice and maize. Millet and sorghum at one time constituted the basic diet of the great majority of the people and still represent, along with cassava and irrigated rice, the main protection against drought in rainfed agriculture. Millet and sorghum were among the

cereals that were promoted by the government in the cereals package deal program.

The provision of improved seeds has long been seen in The Gambia as an important element in the promotion of high yields. Only in recent years, however, has a concerted effort been made to select and test new varieties for their suitability in Gambian conditions and to develop a local seed multiplication and distribution system.

In the case of early and late millet, farmers are accustomed to using indigenous varieties, long established in the region, and, with the heavy cross-border traffic, there has been a good deal of a mixture with seed imported from Senegal. Much the same position existed with sorghum until recently.

Since 1973 efforts to identify improved varieties of sorghum and millet have been intensified. The current new variety of millet has not been proved sufficiently disease resistant; the sorghum variety Naga White proved to be unpalatable, and for both crops further research and field testing is required before the large-scale replacement of existing seed can be undertaken.

In 1977, the Upland crops improvement program was initiated with funding both from local sources (including the government) and from the British government, through its contribution to the World Bank-coordinated rural development project. Millet and sorghum are among the cereals included in the program.

The current Upland cereals research program (with assistance from the GARD project) focuses mainly on the screening of varieties which come primarily from international agricultural research centers and regional programs for possible use in The Gambia. Varietal screening will continue, but on a slightly reduced scale. There has been limited progress in identifying varieties of millet and sorghum that outperform local cultivars, especially under low fertility and low rainfall conditions. One variety of millet which is pest-tolerant by virtue of its long bristles, is being tested on-farm in areas of the country where birds and blister beetles are problems. Research is also being done on response to fertilizer, intercropping, economic analysis, and soil fertility maintenance.

#### 8. Programs in Other Crops

Dunsmore (1975) notes that about fifty annual and perennial crops then produced in The Gambia, only millet, maize, rice, sorghum, cotton, cashew and limes, groundnut, cassava, and vegetables are of major significance. The Gambia food strategy report (1981) added that from a nutritional point of view, some minor crops, including indigenous dark-leaved vegetables (local spinach) may be important and that the study of the local food

markets in the urban areas may suggest that the collective value of the various condiments on sale is greater than appears to be the case. Findo, which is of limited significance in terms of area of cultivation, is normally grown in small plots. Findo fields are normally cultivated as single stand and located in the upland soils. A small quantity of palm kernels is grown in the URD and MID and is exported unprocessed.

Cowpea (a traditional crop in The Gambia), grown mostly in association with millet, sorghum, or maize, is currently being promoted after six years of successful research efforts. MOA, in collaboration with NGOs, is targeting the cowpea promotion campaign to four agricultural divisions: WD, NBD, Mid South, and URD.

D. Summary of the Attributes of the Agronomic Programs that "Failed" and "Why"

1. Cereals Package Deal Program

- o Lack of improved crop varieties
- o Inadequate fertilization of crops
- o Lack of improved farm implements
- o Farmer failure to follow recommended crop husbandry practices
- o Poor communication between extension and farmer
- o Lack of organized marketing

2. Colonial Development Corporation Farm

- o Poor engineering
- o Lack of suitable rice varieties
- o Project beneficiaries' inability to bear recurrent costs

3. Taiwan Agricultural Mission

- o Failure to establish intensive double-cropping
- o Lack of familiarity with machines
- o Lack of improved rice seeds
- o Lack of water control methods

- o Lack of appropriate indigenous mechanical skills
  - o Seasonal shortages of labor
  - o Project discontinuity due to changes in foreign relations with Taiwan and arrival of PRC team
4. Agricultural Development Project
- o Inadequate management system
  - o Inadequate extension strategies
5. Peoples' Republic of China Rice Project
- o Failure to establish double-cropping
6. Jahally Pacharr Smallholder Project
- o High development cost (about D46,500/ha)
  - o Expensive land cultivation and the resulting high operating costs to be passed on to farmers seem unsustainable
  - o Farmers' dependency on project management and technological inputs
  - o Unsatisfactory credit repayment by farmers
  - o Untimely land preparation due to competing use of machines
  - o Failure to achieve gender equity goals
7. Millet and Sorghum Programs
- o Lack of high yielding varieties which can outperform local cultivars under low input and marginal conditions
8. First Cotton Project
- o Farmers' priority of food crops and groundnuts over cotton
  - o Groundnuts less labor intensive than cotton
  - o Cotton not integrated into the farming systems
  - o Lack of motivation by project personnel due to poor pay and lack of transport

9. Onion and Pilot Vegetable Schemes

- o Lack of adequate supervision
- o Lack of grower support
- o Shortage of seeds
- o Drought and inadequate irrigation facilities
- o Low prices of produce
- o Inadequate marketing facilities
- o Local traders not informed of GCU onion-marketing activities
- o Imports of onion were permitted resulting in oversupply
- o Storage losses

E. Summary of the Attributes of the Agronomic Programs that "Worked" and "Why"

Government subsidy on fertilizer and crop protection have helped in the successful implementation of agronomic programs. Other attributes include the following:

1. SWMU/USAID Soil and Water Management Project

- o Project was well conceived, completely managed, and adequately supported by host government
- o Intervention which requires minimum amounts of capital
- o Conformance to existing farming systems
- o Structures relatively inexpensive to maintain
- o Social acceptance and recognition by the rural population
- o Use of self-help, non-paid labor
- o Strong extension component

2. FFHC Rice Program

- o Availability of high yielding varieties of rice

- o Adequate supply of good quality seeds

3. MFP Maize Program

- o Project was well conceived, completely managed, and adequately supported by host government
- o Crop fits into the local farming system
- o Ready and free market with good prices
- o Trained personnel to deliver technology packages
- o Good cooperation with collaborating donor agency/FAO fertilizer program
- o Full farmer participation
- o Effective demonstrations
- o Effective on-farm trial.
- o Fertilizer revolving fund scheme
- o Innovative production techniques in mixed farming
- o Strong producer association
- o Effective research program on maize
- o Intensive promotion campaign

4. CRS Sesame Program

- o No negative impact on established agricultural pattern
- o Availability of adapted sesame varieties
- o Effective extension by CRS
- o Organized group (local womens association) with which to work
- o Suitability of introduced technology to local conditions, i.e. oil processing equipment
- o Acceptability of product to consumers
- o Acceptable price

5. Private Sector Initiative in Horticulture

- o Set domestic and export market
- o Availability of introduced technology suitable to local conditions
- o Good management

F. Innovations Developed in the Agronomic Diversification Activities

1. Innovations Already Adopted by the Farmers

a. Maize

- o Use of four improved maize varieties
- o Use of inorganic fertilizer
- o Use of farm implements (eco-seeder, sine hoe)
- o Thinning
- o Gap filling
- o Top dressing with urea
- o Insecticide application
- o Use of crop residue for livestock

b. Rice

- o Use of nine improved rice varieties
- o Use of inorganic fertilizer
- o Seed drilling
- o Use of farm implements (eco-seeder, sine hoe)
- o Gap filling
- o Top dressing with urea
- o Construction of anti-salt and water retention lining
- o Use of crop residue for livestock

c. Cotton

- o Use of inorganic fertilizer
- o Use of seed dressing
- o Thinning
- o Gap filling
- o Insecticide application

d. Millet and Sorghum

- o Use of farm implements (eco-seeder, sine hoe)
- o Thinning
- o Gap filling
- o Insecticide application (for millet)
- o Use of crop residue for livestock

e. Cowpea

- o Use of four improved varieties of cowpea
- o Thinning
- o Gap filling
- o Insecticide application

f. Horticulture

- o Construction of anti-salt and water retention devices

2. Innovations Developed Which Have Potential to be Accepted by Farmers and Become Sustainable Diversification Activities

The following are technologies presented by research program leaders at the farmer innovation and technology testing (FITT) workshop in May 1989 appropriate for farmer testing.

a. Horticulture (Fruits, Vegetables, Root Crops)

- o Package of improved papaya varieties and improved citrus rootstock

- o Improved varieties of wet season cabbage, tomato, and lettuce
  - o Staggered production of vegetables in the dry season to ease market glut
  - o Pest tolerant varieties of cassava and sweet potatoes
  - o Live fencing for dry season vegetable gardens using lime trees and other suitable materials
- b. Sesame
- o Confectionary-type varieties
  - o Higher plant population to increase yield
  - o Alternate spacing
  - o Relay planting of short-season sesame varieties with cereals or planting just after harvest in late September or early October
- c. Maize, Millet, and Sorghum
- o Use of Super Homite under proper application
  - o Striga-tolerant varieties (for sorghum)
- d. Findo
- o New varieties from Mali
- e. Cowpea
- o Disease-resistant white-seeded variety
  - o Relay cropping of cowpea into early cereals (maize, early millet) yielding a full cereal crop and some additional cowpea
- f. Rice
- o Use of animal traction in rainfed areas
- g. Cropping Systems and Resource Management Techniques
- o Intercropping groundnut with cereals at a ratio of 7:1 yielding good cereals with little loss of groundnut

- o Alley cropping of Cassia and Gliricidia to improve soil fertility
- o Post harvest deep plowing to reduce loss of moisture from the soil
- o Planting of pigeon pea to improve soil fertility

**CHAPTER III**

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**BACKGROUND AND REVIEW OF  
LIVESTOCK DIVERSIFICATION PROJECTS**

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## CHAPTER III

### BACKGROUND AND REVIEW OF LIVESTOCK DIVERSIFICATION PROJECTS

#### A. The Socio-Economic Role of Livestock/Poultry

##### 1. Interdependence of Crops and Livestock

There are many important links between crops and livestock (including poultry) which have led to a very closely integrated agricultural/livestock system in The Gambia. In a broad sense, they each depend on the other as a source of nutrients and other inputs to operate efficiently. Crops are accepted as the most important partner, however, when all animal products (meat, milk, eggs, draft power, dung fertilizer, and hides) are considered the contribution is very significant both monetarily and nutritionally (see table 3 on the following page).

Livestock in The Gambia is made up of cattle, sheep, goats, donkeys, horses, swine, and poultry that live and feed on and around the farms where the crops are growing. Residue from these crops and fallow land grazing provide a minimum of 20 percent and up to 50 percent of the animals' nutrients when bush fire loss of the range grass is high (see table 4 on the page after table 3). The animals graze and browse in the surrounding fallow, non-arable pasture, forest, and swampland to find the nutrients necessary for maintenance and production. Production based on a per-animal unit is very low, however, based on a per-land unit the production is higher than most African countries and compares favorably with many developed countries (Bremer, 1983 and Sandford, 1983).

In return for these crop residues and fallow land grazing, livestock provides the farmer with milk, meat, eggs, hides, draft power, manure for the cropland, and a "bank reserve" for crop inputs and/or family needs. The milk and eggs serve as a daily supply of nutrients and/or minor income for the farm family through local market sales. Sheep and goats provide meat for all families on special occasions and are sold for cash when needed. Goats are also milked by some ethnic groups. A total of 16.5 percent of the average daily protein requirement is provided by these animal products (see table 3 cited above). Together with the protein from fish, the Gambian people have access to enough animal protein to provide 30 to 35 percent of total protein needs.

Eighty to ninety percent of the small ruminant offtake is either consumed at the farm family level or sold at the rural village level while only 10 to 20 percent is marketed through the official urban slaughter facilities. Cattle are also sold for export overseas and to the urban areas, with approximately 50

Table 3. Estimates of Average Livestock Numbers, Production, Value, Nutrient Demand, and Energy Balance, 1978-88

Parameter \ Species	Thousand Units									% of Total Value
	Domestic		Roughage		Foragers		Monogastrics			
	Head	Cattle	Oxen	Small Ruminants	Goats	Equine	Swine	Poultry	Village/Commercial	
Average 1978-88 Head	257.0	28.0	155.0	190.0	27.0	10.0	10.0	278.0	100.0	
Average 1978-88 AU	192.8	21.0	23.3	28.5	13.5	10.0	3.0	1.1	0.5	293.6
Average 1978-88 %AU	65.6	7.2	8.7	9.7	4.6	3.4	1.0	0.4	0.2	100.8 NA
Nutrient Requirements:										
Dry Matter Intake Cap	439710.9	47906.3	74254.7	91021.9	36956.3	27375.0	16425.0	6088.2	2737.5	742475.7
% DM Used/Species	59.2	6.5	10.0	12.3	5.0	3.7	2.2	0.8	0.4	100.0
Energy Requirement MJ	2708619.4	295102.5	636468.8	780187.5	369562.5	273750.0	244185.0	90511.2	40697.5	5439084.4
% Energy Used/Species	49.8	5.4	11.7	14.3	6.8	5.0	4.5	1.7	0.7	100.0 NA
Capital Value Dalasis	325265.6	35437.5	47953.1	58781.3	15035.6	22612.5	5062.5	6255.0	3530.0	520033.1 NA
Production & Value:										
Meat in Kg	2409.4	262.5	871.9	1068.8	0.0	0.0	421.9	208.5	93.8	5336.6
Meat Value Dalasis	45175.8	4921.9	18309.4	22443.8	0.0	0.0	9492.2	23.0	18.0	100384.0 49.4
Milk in Kg	15187.7	0.0	0.0	342.0	0.0	0.0	0.0	0.0	0.0	15529.7
Milk Value Dalasis	36450.4	0.0	0.0	820.8	0.0	0.0	0.0	0.0	0.0	37271.2 18.4
Eggs in Units of One	0.0	0.0	0.0	0.0	0.0	0.0	0.0	889.6	4200.0	5089.6
Eggs Value Dalasis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	667.2	3150.0	3817.2 1.9
Draft Power Value\Dal	0.0	10276.0	0.0	0.0	4954.5	3670.0	0.0	0.0	0.0	18900.5 9.3
Dung Fert. Value\Dal	24184.1	2634.8	4084.0	5006.2	2032.6	1505.6	903.4	334.9	150.6	40836.2 20.1
Hide/Skin Value\Dal	1156.5	126.0	232.5	285.0	0.0	0.0	0.0	0.0	0.0	1800.0 0.9
Total Prod Value	106966.7	17958.7	22625.9	28555.8	6987.1	5175.6	10395.6	1025.1	3318.6	203009.0 100.0
% Total Prod Value	52.7	8.8	11.1	14.1	3.4	2.5	5.1	0.5	1.6	100.0
Total Meat Prod Equiv	5711.0	262.5	871.9	1068.8	0.0	0.0	421.9	234.3	318.3	8888.7
Total Food Energy Prod	66943823.2	2031855.0	6748661.3	9360057.8	0.0	0.0	3265481.3	1856704.7	1872123.2	92078706.5
Total Food Protein Pro	1257521.0	77437.5	257203.1	327593.3	0.0	0.0	124453.1	66664.6	52004.1	2162876.7
Food Energy Balance	66943823.2	2031855.0	6748661.3	9360057.8	0.0	0.0	3265481.3	1856704.7	1831425.7	92038009.0
Food Protein Balance	1257521.0	77437.5	257203.1	327593.3	0.0	0.0	124453.1	66664.6	51429.2	2162301.8
Food Energy gm/d/cap	62.2	1.9	6.3	8.7	0.0	0.0	3.0	1.7	1.7	85.5
% Daily Energy Require	3.1	0.1	0.3	0.4	0.0	0.0	0.2	0.1	0.1	4.3
Food Protein gm/d/cap	4.9	0.3	1.0	1.3	0.0	0.0	0.5	0.3	0.2	8.4
% Daily Protein Requir	9.6	0.6	2.0	2.5	0.0	0.0	0.9	0.5	0.4	16.5

Source: DAHP; MASS; Sumberg, 1988; and Calculated Interpolations  
Sahel Development Planning Team/USAID, 1984, Dickey and Huque, 1986.

Notes: One Kilogram Meat Equivalent = 5.3 kg. milk or 34.5 eggs based on average protein and energy

Table 4. Natural Feed Resources Availability and Percent Used in The Gambia

Value Season/Source	Dry Matter Feed Available			Energy Consumed		
	% of Total Supply	Metric Tons	Con- sumed Tons	Thousand MJ Units	% of Total Consumed	
Dry Season Total	81.8	1167537.0	33.8	394854.5	4730466.7	60.2
Range/Browse	56.4	805350.0	30.0	241605.0	2899260.0	36.9
Upland Range	40.6	579350.0	30.0	173805.0	2085660.0	26.5
Swamp Grazing	15.8	226000.0	30.0	67800.0	813600.0	10.4
Cropland	25.4	362187.0	42.1	153249.5	1831206.7	23.3
Fallow Grazing	10.1	144839.0	30.0	43451.7	521420.4	6.6
Crop Residue	14.5	206822.0	51.7	107018.6	1284223.2	16.3
Grain Stover	6.0	85373.0	40.0	34149.2	409790.4	5.2
Gr.Nut Hay	8.5	121449.0	60.0	72869.4	874432.8	11.1
By-Products	0.7	10526.0	20.2	2779.2	25563.1	0.3
Gr.Nut Cake *	0.6	8463.0	22.0	1861.9	22342.3	0.3
Sesame Cake	0.1	721.0	0.0	648.9	7786.8	0.1
Rice Bran *	0.1	1342.0	20.0	268.4	3220.8	0.0
Rainy Season Total Est. Intake Only	18.2	260625.0	100.0	260625.0	3127500.0	39.8
Range/Browse	14.6	208500.0	100.0	208500.0	2502000.0	31.8
Cropland	3.6	52125.0	100.0	52125.0	625500.0	8.0
Annual Total/Aver.	100.0	1428162.0	45.9	655479.5	7857966.7	100.0

\* If no groundnut cake & rice bran were exported, total energy supply would be only 1.4 percent.

percent of the estimated offtake being slaughtered in the official urban facilities. A high percentage of cattle is probably consumed in the urban areas because of unofficial slaughtering done in and around many towns. Cattle also serve as a cash reserve for such needs as crop input purchases, emergency medical treatment, weddings, funerals, and other social formalities. Both draft power and manure go directly to facilitate and increase crop production and movement of the crops from the fields to farm storage or market. The major portion of land preparation, planting, and weeding (possibly 80 to 90 percent of upland farms) is done by animal traction except in the women's upland and tidal rice, and irrigated rice areas (Personal communication-ANTRAC Group, 1989). Manure produced by the livestock from the crop residues and the grazing/browse from non-arable land is returned in large part to the arable land where cattle are tied for bedding at night. While grazing stubble fields after harvest, both cattle and small ruminants serve to break up the crop residue and incorporate a portion of it into the soil, adding needed organic matter.

## 2. Other Benefits

Social benefits include a basis for exchanges which cement relationships at the local level and provide a practical measure of status. Many heads of the larger compounds, village leaders, and civil servants from the urban areas own livestock, which is herded with another farmer's livestock. In the past, western researchers and developers have considered the maintenance of large herds of cattle to be primarily for status. However, studies have shown that farmers are being forced to make short-run decisions, in the absence of viable alternatives, to feed and care for the people for whom they are responsible (Sandford, 1983). Further, the average age and percentage of males in the Gambian cattle herds plus the rapid decline in number of cows over seven years of age indicate that animals are being sold or traded at a reasonable age (ITC Third Annual Report 1987/88). It therefore becomes apparent that farmers/herders are selling a higher percentage of the herd as the human population of the village increases.

## B. Livestock Ownership and Use Patterns in The Gambia

### 1. Livestock on the Farm

#### a. Current Status

More than 90 percent of the 45,000 dabadas (farms) own some type of livestock other than poultry (Sumberg, 1988). Almost all farms raise poultry. Sheep and goats are the next most common animal on the farm at 85 percent, while cattle are owned by only 48 percent of the dabadas (Mixed Farming Report No.10). Some type of draft animal (ox, donkey, or horse) is

owned by 70 percent of the dabadas. (Twenty-five percent have at least one ox, 23 percent have one horse or more, and 51 percent have one or more donkeys.

The average farm, described in more detail in the Mixed Farming Report No. 10, consists of approximately 4.2 hectares of land cultivated by an extended family of 18.4 persons (12 adult equivalent) and planted to 1.42 ha groundnuts, 1.39 ha. millet, 0.55 ha. maize, 0.42 ha sorghum, 0.21 ha rice, 0.16 ha. findo, and 0.03 ha. cotton.

The MFP survey found the mean and average number of ruminant animals to be respectively, 6.4 and 13.7 for cattle, and 5.0 and 9.8 for small ruminants (equal for sheep and goats). Using NASS survey figures for 1986/87 and 1987/88, Sumberg and Gilbert (1988) reported that seventy percent of the farmers owned an average 1.5 head of draft animals. The average number of poultry per dabada is estimated to be 8 chickens by simply dividing 90 percent of the number of poultry (backyard production portion reported by Grober, 1988) by that of the dabadas reported in the latest NASS survey (1988/89). A few farmers have swine, but as they are in such small numbers and not acceptable as a food source by most Gambians, they are not considered in this discussion.

Cattle and draft animals are most commonly the property and affairs of the men, while the small animals tend to be the property and affairs of the women.

#### b. Typical Farm

The average farm discussed above is expanded here with several assumptions added from aggregate data obtained from other land use and livestock reports and renamed "typical farm". While this "typical farm" will be used to make some calculations in the remainder of the livestock sections, it should be understood that each factor is highly variable, consisting of many combinations and often excluding crops and/or livestock. For the "typical farm" both findo and cotton will be dropped and their land assigned proportionally to the other five as follows: 1.5 ha. groundnuts, 1.45 ha. millet, 0.58 ha. maize, 0.45 ha. sorghum, and 0.22 ha. rice. Access to common land is assumed to be equivalent to the relative size of the farm; therefore, the portion would be 4.85 ha. pasture/forest, 0.27 ha. fallow, and 0.19 ha. swampland based on area data reported in these categories in the Gambia German forestry project report, 1983.

The "typical farm" will be assumed to have the mean number of ruminants, an undefined species combination of 1.5 head of draft animals, and 8 chickens (may include a small number of ducks and/or guinea fowls), which would tend to represent the largest number of farms due to the skewed effect of few farms

having larger numbers of animals. Following is a summary of the "typical farm" for future reference in this report.

"Typical Farm"

<u>Category</u>	<u>Number of hectares or head</u>
Family Members	18.4 (12 adult equivalent)
Cultivated land	4.2 ha.
Groundnuts	1.50 ha.
Millet	1.45 ha.
Maize	0.58 ha.
Sorghum	0.45 ha.
Rice	0.22 ha.
Commons land access	5.1 ha.
Pasture/Forest	4.85 ha.
Fallow	0.27 ha.
Swampland	0.19
Livestock/Poultry	6.7 A.U. (250 kg. live wt.)
Cattle	6.4 head
Sheep/Goats	5.0 head
Draft Animals	1.5 head
Poultry	8.0 head

2. Draft Animal Use

a. Bovine

(1) Oxen

Widespread use of oxen is common, yet the number stays fairly constant (increasing because of government promotion and growing farmer interest and decreasing because of disease and other problems). In recent years an increase has taken place because the farmers have easy access for the purchase of implements from Senegal. Oxen are used primarily in pairs for the plowing of uplands, while they are less often used for the lighter work of planting and weeding (Cham, 1986). It is understood that transport use of oxen is limited due to their slow pace. They are not commonly used in rice cultivation because of the heavy soils in the lowlands and because most of the upland rice is farmed by women who neither own nor have access to draft animals. Research by Sumberg and Gilbert (1988), reported that existing methods, such as plowing after irrigation, might encourage more effective oxen-powered tillage. In Bangladesh and other Asian countries, oxen and cows of a smaller breed than the N'Dama are used successfully to cultivate flooded rice fields. The Department of Agriculture is investigating the

potential for women to obtain access to existing farm draft animals and implements. During an interview with a farmer living on the north bank, the farmer stated that he and other farmers are using single ox yokes. With the popularization of "minimum tillage" the use of single oxen for lighter work may increase. Most oxen are owned in pairs; however, farmers with only one or no oxen often hire or trade off with other farmers to cultivate their fields.

## (2) Cows

Cows have rarely been used for draft purposes in The Gambia; however, on the north bank the practice is increasing as reported by farmers and NGO technicians. Multi-purpose use of cows has become increasingly important in Senegal where research has found that reproduction and milk yield increased in draft cows over the non-draft cows due to the fact that the draft animals are fed better than cows in the herd. The use of cows for draft is common in many Asian countries. However, when used for draft purposes under poor nutritional conditions, reduced reproduction and milk yields have been observed. In spite of this disadvantage, Bangladesh farmers continue to increase their use of cows for draft power, explaining that "We do not have enough feed on our small farms (average 1.2 ha) to feed a bullock all year for only a short period of cultivation, when we can keep a cow and get a little milk and a calf" (Dickey and Huque, 1986).

### b. Equine

Numbers of equine in The Gambia have increased by over 300 percent in the past 30 years, primarily from Senegalese imports and due to the reduction of the trypanosomiasis threat (Sumberg and Gilbert, 1988). Due to the poor reproductive and survival rates reported by Sowe, et al (1988), it was impossible to maintain the 1958 herd numbers without imports. Most of these imported equine and other species of livestock were moved south from Senegal into The Gambia during the droughts of the early 1970s and early 1980s. The recent years of dry conditions observed in The Gambia has possibly reduced the tsetse fly and the threat of trypanosomiasis to the equine population (Snow and Clifford, 1989).

Casual field observations made 15 years ago indicated that most equine were made and were used for draft during the planting season, died during the rainy season, and were replaced with imports in time for the next planting season. Today, according to Clifford, many females and foals are seen in the field indicating efforts are being made to maintain the herd internally. Observations of draft animals being used for cultivation and planting were made in mid June 1989 from Banjul to Basse on the south bank and from Georgetown to Banjul on the

north bank. These observations show a predominance of donkeys and equal numbers of horses and oxen at work in the fields.

(1) Donkeys

The use of donkeys is primarily for planting, weeding, and cart transport as a single animal. Minimal tillage has facilitated the use of donkeys, which are small and limited to light work, however, the donkey is faster than the oxen and takes less nutrients to maintain. These factors have undoubtedly been important in the popularization of the donkey.

(2) Horses

Fewer horses were observed in the cultivation and planting operations mentioned above, however, horses were seen pulling as many cultivator/planters singly as were pulled by pairs of oxen. Horses are also used for cart transport and as saddle horses.

C. Livestock Systems in The Gambia

1. Livestock Dynamics over the Past 30 Years

The records of livestock numbers before 1958 seem to be limited mainly to cattle. Recently there has been only periodic reporting by the Department of Animal Health and Production (DAHP, now Department of Livestock Services-DLS). In 1986 the first national agricultural sample survey was undertaken. There were years of ample rains before the drought hit the countries to the north of the Sahel causing many livestock to be moved to the southern Sudan in the late 1960s and early 1970s. It is suspected that many cattle, and possibly other livestock, were moved into The Gambia in search of grazing during this drought period. Through the 1970s and until 1984, the last year reported by the DAHP, the reported cattle numbers increased by only 15 percent. (See table 5 on the following page.) Again, the high estimate of 1984 was during a year when the Sahel had a severe drought and it is believed that many Sahelian livestock were moved south again, possibly influencing the estimate made from vaccination campaign records that year.

Since the NASS took over the livestock number estimation in 1986, the reported numbers have varied from the 1984 high figure to a reduction of 23 percent, then to a high this year showing a 39 percent increase in five years (table 5). The NASS results reporting a 57 percent increase in only two years (from 1986 to 1988), could be caused by migration or a sampling error, but such fast internal herd growth would not be possible given the low production rates. Sumberg (1988) suggests that a sampling error was probably responsible for the high estimate in 1987/88, but

Table 5. Estimates and Interpolations of Livestock Numbers, 1958 to 1988

Year	000 Head								
	Species	Cattle		Small Ruminants		Equine		Monogastrics	
	Herd	Oxen	Sheep	Goats	Donkeys/Horses		Swine	Poultry	
1958/Head	129.000	14.000	100.000	100.000	4.300	4.000	5.000	200.000	NA
AU*	96.750	10.500	15.000	15.000	2.000	4.000	1.000	1.000	145.250
%AU	66.609	7.229	10.327	10.327	1.377	2.754	0.688	0.688	100.000
1970/Head	218.600	24.000	100.000	100.000	7.000	4.000	6.000	225.000	NA
AU*	163.950	18.000	15.000	15.000	3.500	4.000	1.800	1.125	222.375
%AU	73.727	8.094	6.745	6.745	1.574	1.799	0.809	0.506	100.000
1974/Head	271.000	26.500	140.000	150.000	10.500	5.000	7.000	225.000	NA
AU*	203.250	19.875	21.000	22.500	5.250	5.000	2.100	1.125	280.100
%AU	72.563	7.096	7.497	8.033	1.874	1.785	0.750	0.402	100.000
1978/Head	293.200	27.000	146.000	158.100	13.000	5.000	9.000	250.000	NA
AU*	219.000	20.250	21.000	23.000	6.000	5.000	2.000	1.000	297.250
%AU	73.675	6.812	7.065	7.738	2.019	1.682	0.673	0.336	100.000
1983/Head	258.400	27.000	150.000	175.000	15.700	4.700	10.000	350.000	NA
AU*	193.000	20.250	22.000	26.000	7.000	4.000	3.000	1.000	276.250
%AU	69.864	7.330	7.964	9.412	2.534	1.448	1.086	0.362	100.000
1984/Head	278.300	27.000	150.000	185.000	20.000	7.000	10.000	350.000	NA
AU*	208.000	20.250	22.000	27.000	10.000	7.000	3.000	1.000	298.250
%AU	69.740	6.790	7.376	9.053	3.353	2.347	1.006	0.335	100.000
1986/Head	213.500	28.300	149.800	192.500	36.500	15.400	10.500	400.000	NA
AU*	160.000	21.225	22.000	28.000	18.000	15.000	3.000	1.000	268.225
%AU	59.651	7.913	8.202	10.439	6.711	5.592	1.118	0.373	100.000
1987/Head	282.500	24.400	174.800	208.100	38.400	17.100	10.900	459.700	NA
AU*	211.000	18.300	26.000	31.000	19.000	17.000	3.000	1.000	326.300
%AU	64.664	5.608	7.968	9.500	5.823	5.210	0.919	0.306	100.000
1988/Head	386.800	37.100	162.300	225.200	41.800	16.400	10.900	459.700	NA
AU*	290.000	27.825	24.000	33.000	20.000	16.000	3.000	1.000	414.825
%AU	69.909	6.708	5.786	7.955	4.821	3.857	0.723	0.241	100.000
Av. Head	285.000	28.000	155.000	190.000	27.000	10.000	10.000	378.000	NA
1978 AU	213.000	21.000	23.000	28.000	13.000	10.000	3.000	1.000	312.000
1988 %AU	68.269	6.731	7.372	8.974	4.167	3.205	0.962	0.321	100.000

Source: DAHP; NASS; Sumberg, 1988; and Calculated Interpolations

added that comparing estimates of years with different survey methods could not be done with confidence.

The average annual cattle herd growth rate of five percent for the 1960s and less than one percent for the 1970s and early 1980s can be more easily rationalized than the seven percent for the years since NASS has made the estimates. The contradictions might reflect a variance in the methods of estimation rather than a real difference in the number of cattle. From personal observations of livestock and range conditions in The Gambia over the past ten years, it appears that the herd growth is relatively low. In conclusion, it is accepted that the size of the herd is not known with any degree of accuracy but probably lies between the extreme estimates.

The few estimates of other livestock have indicated a slow increase of sheep and goats, while equine have increased by over 300 percent in the past 15 to 20 years. The basis for previous estimates of swine and poultry has not been determined, but they are rarely reported outside the FAO Yearbook (and only as an estimate there). The NASS 1988/89 reports of swine and poultry indicate a near stable swine number and an increase in poultry of nearly 100 percent in the past 10 years.

Table 5 gives the available estimates and interpolations on missing data to allow the estimation of total animal units (A.U.=250 kg. of liveweight equivalent) for the purpose of measuring the total demand on the feed resources of the country.

## 2. Feed Resources for Livestock

Natural forage and crop residues make up more than 99 percent of the feed resources in The Gambia (table 3). The 10,690 square kilometers of land area of The Gambia is roughly 39 percent wood land, 9.2 percent fallow land, and 6.4 percent uncultivated swampland (all of which provide grazing at some time of the year); 33.8 percent cultivated land (which provides crop residues and minor regrowth grazing in the early dry season) and 11.6 percent ungrazed mangroves, barren flats, water surfaces, and towns (GGFP, 1983). Table 3 presents the feed produced and amount used in terms of dry matter and energy. This shows the relative importance of different lands and types of nutrients available. Table 3 also shows that non-arable lands provide 69 percent of the total nutrients and arable lands provide 31 percent. High-fiber roughages make up 98.7 percent of this supply, with only 3 percent coming from agroindustrial by-products. If all the agroindustrial by-products were used domestically this percentage would only rise to about 1.4 percent. The conclusion from the analysis of these natural feed resources is that they are best suited for ruminant production and that minimal potential for supplemental feeding with the national production is indicated.

The estimate of total dry matter available is almost the same as that reported in the 1984 USAID strategy statement for The Gambia. This USAID report was based on CILSS/IEMVT estimates that further stated that utilization was expected to be only 34 percent and would only support about 185,000 AU. The estimates reported in table 3 indicate a utilization of 34 percent, which is influenced in large part by the almost 60 percent utilization of groundnut hay and the assumption that limited green forage loss is realized during the rainy season grazing. This amount of usable DM or energy will maintain a herd maximum of 260,000 AU annually. That appears to be somewhat less than the amount needed for the 1988 number of 378,000 AU, but only 12 percent below the needs for the average herd of 291,000 AU reported for the last 11 years. Given the observed undernourishment of the herd during the long dry season, this shortfall is apparent in most years.

The findings of this team seem to indicate that the herd may, in fact, be closer to the 11-year average estimate than that of 1988. Admittedly there is no firm basis for accepting the earlier estimates by vaccination count any more than there is for the NASS estimates. The actual higher stocking rate found here can partially be explained by the high percentage of cultivated land and density of people, two factors which have been reportedly associated with high densities of livestock (SDPT, 1984). This relationship is supported by the positive regression of animal units on both percent of cultivated land and human population density in the four interior divisions of The Gambia. (See table 6 on the following page). Therefore, as the cropland increases there is a tendency to have a higher stocking capacity due, apparently, to the added crop residue availability. Bangladesh is another example of this relationship, where one of the most highly cultivated countries (63 percent of the area) is cultivated at 155 percent per year, and the highest people density (over 600 people/square kilometer) is associated with one of the highest livestock densities of 123 AU per square kilometer. This relationship for The Gambia, as shown in table 6, indicates a human density of 59 people per square kilometer and an animal density of 33 AU per square kilometer.

It should be noted that much groundnut crop residue is marketed, some of which is believed to be sold across the border, thus making it unavailable for Gambian livestock. On the positive side, the price is very good adding a considerable amount to the farm income. As much as D645/ha was estimated to be added to the groundnut grain income of D1800/ha. (N'Jai and Sumberg, 1988).

Table 6. Association of Agricultural Population Density, Percent Cultivated Land, and Total Crop Production on Density of Livestock

Division\Species	Percent Land Cultivat	Total Prod kg	Density Ag. Pop. Km Sq	Density Livestock AU/km sq
Western	20.171	35.300	90.171	27.654
North Bank	21.991	46.100	60.271	24.893
L. River	11.883	23.100	38.312	24.763
MID (N)	15.203	24.300	42.297	33.529
MID (S)	19.366	29.000	56.972	48.961
U. River	21.878	39.000	61.675	43.912
The Gambia	18.843	196.900	59.306	33.481
r2=LSK DENSITY ALL DIVISIONS	0.102	0.007	0.000	
X Coef. LSK DENSITY ALL DIVISIONS	0.816	-0.096	-0.009	
r2=LSK DENSITY 4 DIVISIONS	0.839	0.455	0.839	
X Coef. LSK DENSITY 4 DIVISIONS	2.222	1.008	0.878	

Source: DAHP; NASS; Sumberg, 1988; and Calculated Interpolations

### 3. Management

#### a. Cattle

##### (1) Traditional

Cattle are usually tended by a herder or farmer herder on a part-time basis. During the day in the dry season when there are limited crops grown, the cattle are generally let free to graze the range lands or crop lands as they choose. Just after harvest (including some groundnut hay not harvested), the cattle are herded onto the crop residue where they find plenty to eat for several weeks, after which they may choose to graze the range again. Another option for the herder/farmer early in the dry season is burnt-over pasture/forest which may have been intentionally burnt. Even when the herder leaves the animal unattended part of the day in these natural pastures, he has to water them at the village well or at a water point within a few kilometers.

The cattle are tied at night in a bedding ground (Correo) on the cultivated area thereby fertilizing the land. This bedding ground is rotated periodically to distribute the dung/urine fertilizer over the ground as uniformly as possible. Frequent movement of the bedding ground also aids in the prevention of a buildup of intestinal parasites, which are especially hard on the mortality and morbidity rate of recently weaned calves. Early morning, after milking and separating the nursing calves from the cows, the cows are taken out to graze. Nursing calves are moved to a different area from the cow herd and allowed to pick and graze close to the village. The herder returns the cows, the few adult males, and the young growing stock (more or less 1-4 years of age), to the bedding ground to be tied for the night. The cows are nursed by their calves, and usually milked for a second time. This allows the herd five or six hours of grazing per day. Since there are no crops in the dry season, it is understood that male cattle are often left free at night, which allows a longer grazing time.

While most herds stay within five to ten km. of the village, some migrate to lowland areas or to the Casamance in Senegal for the last few weeks of the dry season. There are reports of conflicts between migrating herders/farmers and rice farmers who are moving into these previously non-farmed lowlands. It has been reported that the Senegalese often bring herds from the north into The Gambia while Gambian herds are moving into Senegal to the south in search of more moisture and dry season forage than can be found in their homeland. Some animals that moved across the borders may remain permanently while others, after the dry season, return to their homeland.

The animals are closely guarded and sometimes moved some distance from the village during the growing or harvest season in order to avoid crop damage. The herder is obliged to remain with the herd traveling far from the cropland in non-arable pasture land or forest land used in common by all the herders and farmers of both nearby and distant villages. In the rainy season less time is needed for watering because there are many natural water holes.

Production parameter estimates vary considerably, but range as follows: age at first calving, 40-60 months; calving rate, 35-60 months; mortality, from 15-30 percent for calves to 3-5 percent for adults; adult weight, 250-300 kg for males and 200-220 kg for females; and milk yield, 0.39-1.02 lt. per day. These parameters are generally summarized as resulting in about a 10-percent offtake for cattle, that is, the herd will produce 10 percent of the total weight of the herd each year plus milk, which is often a sizable portion of the produce value (table 2).

## (2) Commercial

The only commercial-type operations reported or observed are the ranches or stations of the Livestock Marketing Board (LMB) and the International Trypanotolerance Center (ITC). The LMB is planning two ranches, or "old holding points," which are intended to be operated as a village herd would be managed. They will be using the same common lands as the farmer/herders and will be in direct competition with the farmer/herder for limited forage, except that they will not have the crop residue to support their herd in the dry season. They intend to fill this gap with concentrate supplements and purchased rice straw.

ITC is operating three research centers across the country in order to represent all ecological types and levels of disease stress. They are following the 1983 SDPT/USAID recommendations very closely to conduct research at the village-herd level. They are also doing on-station research in support of the village herd work. However, they have been buying many males, in excess of on-station research needs, for the purpose of fattening and selling to LMB, in direct competition with the farmer/herder. Such ranch-type operations were specifically discouraged by USAID in the African Livestock Strategy Statement of 1982, and it is recommended that the GOTG and the research station leave such business to the private traders or feeders as the market indicates. It is understood that ITC has terminated buying males for this purpose and will reduce their herd operation to a breeding cow herd plus a few research males.

b. Sheep and Goats

Sheep and goats are usually maintained near the village. Little attention is given to them during the day in the dry season, but at night they are gathered in the compound for protection. The women and/or children most often tend these small ruminants. Sheep and goats present a threat to the crops and, to prevent the animals from grazing on the crops, they are often herded by a child. It has recently been reported by an ITC collaborative study that some ethnic groups milk goats, while other groups do not.

Due to the high reproductive capacity of sheep and goats their offtake is reported to be about 30 percent meat production. The milk yield of this local trypanotolerant goat breed is believed to be relatively low, but very important to the family nutrition.

c. Draft Animals

Draft animals, oxen, donkeys, and horses, are most often tied or corralled within the compound where they are handfed. The main feed is groundnut hay supplemented occasionally with oil cake or rice bran. Cut and carry of native forage grass is also a source in the rainy season. Most of the groundnut hay is fed to the draft animals.

d. Poultry

(1) Village Level/Traditional

The village poultry, mostly chickens, are scavengers, getting their nutrients from compound grounds and nearby surrounding areas. These nutrients include natural grass seeds, insects and worms, waste grain that is dropped in handling and harvest, kitchen waste, and some of the home-milled by-products, which they may share with the draft animals or small ruminants. The poultry are free to roam and forage during the daylight hours, but are brought into the compound to roost, or are caged for the night. These birds are kept for the eggs they produce and are slaughtered on special occasions or sold. Both eggs and live chickens are almost always seen in the village markets. Village poultry is estimated to make up 90 percent of the poultry population (Grobar, 1988). Using Grobar's estimates along with ones from an FAO poultry consultant's report (1987) and from DLS, this team estimated village poultry to account for only 22 percent of the egg production and 70 percent of the broiler/hen meat production. The low production rate is reportedly a combined result of limited nutrition and a high disease rate, especially Newcastle, Fowl Pox, and Gumboro. Very little attention is given to poultry either to improve the health or nutritional status. The low production in the Gambian village

poultry population leaves a big potential for production increase if a cost-effective intervention is identified. Offtake percent has been reported to be 100 percent, which is low for chickens (each of the hens making up 80 percent of the flock has a potential of producing several chicks to maturity if mortality is reduced), but under present health and limited nutritional conditions, it could even be overestimated at 100 percent. For lack of better data the team will use the 100 percent offtake figure in subsequent calculations of production and value potential of possible interventions. Estimates provided by the Peace Corps suggest that village production and offtake is somewhat higher than those reported.

## (2) Commercial Poultry

The commercial poultry industry is relatively small, but, due to available technology, equipment, day-old chicks, vaccines, and feeds from historically large poultry producing countries which are easy to import and inexpensive, the industry operates near the same efficiency level as those in developed countries (Wentworth, 1988). The same disease threat faces the commercial birds, but they are normally protected by vaccination. The commercial growers are interested in producing for the tourist hotel trade, however there are problems with quality of supply in the short tourist season, slaughter, and cold-storage facilities. The tourist needs, therefore, are apparently met in a large part by imports from Europe. It is understood that most of the poultry production is sold through the supermarkets to the wealthier Gambians and expatriate residents. According to the data gathered, imported feed grains are primarily used because of lower price and higher quality than the locally mixed poultry feed. The feed mills have sufficient capacity to mix four times their present output, if they could get the quality ingredients locally at an affordable price.

## (3) Swine

Because of religious prohibition of eating pork, only the small non-Islamic community is interested in keeping swine. The small national herd of about 10,000 head are essentially scavengers at the farm level. They are apparently left to range for themselves with little attention, however, no reliable source of information has been found that would give a detailed account of their management. It is understood that a few are raised on a semi-commercial basis to supply expatriates and the tourist trade.

#### 4. Marketing

##### a. Village Market

Most villages have a regular market or smaller place where farm produce and animals are traded. The animals are often slaughtered in the village for distribution, are sold to the villagers, or are purchased by a trader (intermediary) for resale or contract sale at a larger market. A few villages have a slab or location designated by the LMB or DLS for slaughter and meat inspection. According to Quarcey (1989), 31 villages have been assigned a livestock assistant for meat inspection and other minor animal health treatments for the village herds. Weekly markets are most common so traders can move on a daily basis from one market to another. This is the initial process for essentially all animals marketed. The traders may use cash or buy on credit from the farmer. Usually traders buy on credit because they have very little capital and could only afford one or two animals per market day if no credit was available. The traders help the farmers/herders to establish the correct price for the animals and in turn try to sell them to other farmers or agents (buyers who collect animals for transport to the urban markets such as Banjul). These agents traditionally used riverboat transport, but in the past 10 years trucking has become very common and saves time getting to the market even though the actual transportation cost by river is cheaper. These agents are also usually short of cash and normally buy on credit.

##### b. Urban Market

The urban market usually consists of trading between agents and butchers, who also buy on credit in most cases. The butchers in the nine small towns through the country buy whatever they expect to sell in one day. However, it has been noted that day-old meat is often on the meat block, without refrigeration. The butchers in these towns slaughter their own animals at municipal facilities which are reportedly inspected by DLS meat inspectors, some of whom have had short-term training at the FAO training centre in Botswana. Banjul is the biggest and terminal market. LMB receives animals and agents at the LMB market (bedding ground) next to the LMB central abattoir (slaughter house) and LMB/Belgium tannery at Abuko. Farmers in the Abuko area also use this market as their primary market. The Banjul butchers meet the agents and deal for the cattle and small ruminants on a free-market basis, in equal competition with LMB, the supplier for the armed forces and police, other government organizations, and for retail to the tourist hotels and other retail outlets they would like to develop. Approximately 50 percent of the cattle offtake and between 10 and 20 percent of the small ruminants are marketed and slaughtered in these 10 urban centers. The LMB managing director informed the team that the urban livestock consumption has gone down in the past three

years since devaluation of the Dalasis and the associated tripling of livestock prices. However, previous bovine kill was reportedly around 25-30 head compared with present slaughterhouse records, which indicate an average of 30-35 per day. The decline has apparently been on a per capita basis.

The credit chain continues up to the butcher who sells for cash. Even though the LMB was originally set up to provide credit to the agents so they could pay cash to the traders, who in turn could pay cash to the farmers, the LMB is now on the other end receiving credit from the small farmer.

Finally, the retail buyer is expected to pay cash to the butcher and the buying chain begins again. It is said that there is a mutual benefit if the farmer can afford to wait a few weeks or months while the animal is traded and eventually reaches the final buyer who starts the repayment process. In the case of LMB, the managing director informed the team that they were about 45 days behind on payments to the agents. He did not venture an estimate of length of time for farmer repayment.

Judging from this process it is easy to understand why the farmers are resisting the sale of animals to LMB and Banjul if they have the choice of selling at the village or town level for a slightly lower price and receiving their money more quickly.

LMB requires that all animals sold in the Banjul area be slaughtered and inspected at the central abattoir. They charge D45 for Bovin and D10 for small ruminants, which is below cost, to encourage the butchers to use the facilities. LMB estimates that they slaughter 90 percent of the Bovine and 40 to 50 percent of the small ruminants sold in the Banjul area.

### c. Tourist Hotel Market

The tourist market is relatively small and seasonal, however, hotel managers report that 80 to 90 percent of the 200 to 300 tons of meat used is purchased from local suppliers. It is unclear as to whether LMB sells carcasses or hindquarters directly to the hotels through their retail outlet or if some private individual is a go-between. The prime cuts such as fillet are imported directly from Europe by the hotels in a total annual quantity of about 60 metric tons. Poultry are also imported, but LMB has no record of imports because they are not asked to perform their official role of issuing import licenses. Using unofficial reports from DLS, it is calculated that about 2,250,000 eggs and 130,000 kg of broilers are imported for both the tourists and the general public. These estimates would mean that imports make up 29 percent of the domestic egg supply and 19 percent of the domestic broiler meat supply.

d. Export Market

(1) N'Dama and Dwarf Sheep and Goats

Other activities of LMB include promoting the sale of N'Dama cattle and Dwarf sheep and goats (trypanotolerant breeds) to other countries in west and central Africa where they have various donor and private interest in increasing meat production in high-risk trypanosomiasis areas. The last big sale was approximately 5,000 head supplied to Nigeria over a four-year period (1980-83). Two small shipments of 600 head to Gabon in 1987 and 312 head to Ghana in 1988 show a shrinking interest. The managing director reported that the export of N'Dama cattle has been their most profitable project. In fact, the early average village price paid by LMB was D431, handling costs were D466, and the sale price was D1225. Profit was D328 per head, which LMB realized without passing it on to the farmers/herders. However, the director went on to say that the margin has been reduced to a point that it is difficult for the foreign buyers to strike a deal with LMB. The herders are reluctant to sell more females, as was predicted by a Sahel development planning team/USAID report to USAID/Banjul in 1983 suggesting that the offtake of the best quality heifers at such numbers would reduce long-range quality of the herd and also reduce herd numbers at a faster rate than desirable. The managing director confirmed that the herders also had these reservations and no longer present their best heifers for sale. With the reduction of the quality offered by the herders and increased buying price, it became difficult to meet the small orders of 1987 and 1988. They were only partially filled due to non-availability of good-quality heifers. The Ghana order had also requested a small number of Trypanotolerant sheep, but LMB could not fill the order. The managing director holds on to the hope that they can still export at a profit for LMB if they can just find a good buyer. However, the experiences he related for the past few years do not indicate a strong export demand.

(2) Tannery

The tannery (Gamtan) is a fairly new activity, having been started in 1983/84. LMB owns 40 percent and Corroire Vervetoise of Belgium owns 60 percent. Management was the total responsibility of Corroire Vervetoise until last year when it was turned over to Gambian management. In 1965 they started processing local hides and skins at a relatively small number. Processing has now increased to over 18,000 hides and 20,000 skins amounting to about 55 percent of the plant capacity at optimum operational conditions. According to the LMB managing director, efforts to expand the hide and skin numbers by importing from Guinea Bissau and Mali have failed. The Gamtan general manager explained that due to the old age of the equipment and limited maintenance, they could not operate at full

capacity. He suggested that, given the opportunity, Gamtan could take over the buying and collecting of domestic hides and skins and more efficiently meet the needs of the tannery and provide a steady market. Last year was the first year that a profit was shown over operational cost, but lack of maintenance may influence the returns in the future unless outside help is obtained to replace wornout equipment.

## 5. Animal Health

The farmers/herders do very little in the way of disease prevention except to move the bedding ground, which tends to reduce the infestation of intestinal parasites. However, the real reason for moving the herd is to spread the dung for fertilizer. The DAHP (DLS) has had the mandate to provide animal services, but field shortages of personnel, vehicles, fuel, and vaccines and medicine have made it difficult to function efficiently. They have conducted several vaccination campaigns and spot vaccinations against certain outbreaks that appear to have been successful. While no real measures of economic benefit have been applied in The Gambia, a 1985 World Bank study by DeHann and Nissen, report cost/benefit ratios of 1:8 for both Rinderpest and Foot and Mouth vaccination and an internal rate of return of 12 percent to 53 percent for brucellosis. This supports the USAID Livestock Strategy for Africa 1982 recommendation to improve animal health delivery. Hopefully, the ITC group will add to this knowledge in the village-level epidemiology studies, including cost/benefit analysis.

### D. Interventions to Support Livestock

#### 1. Institutional Level

##### a. Extension and Development

##### (1) Past Projects

##### (a) General

A wide variety of activities in the history of livestock support to The Gambia is recorded. However most early activities were directed toward animal health, animal traction, and livestock marketing, with the exception of a few studies in animal and resource management.

The veterinary unit was created by a Colonial award granted to The Gambia in 1933 to control Rinderpest and Contagious Bovine Pleuropneumonia (CBPP). Further grants in 1943 and 1948 strengthened the Veterinary Department and built the headquarters and laboratory at Abuko in 1948.

(b) Livestock Marketing Board

GOTG became involved in livestock marketing in 1953 and created the Cattle Marketing Board (CMB) in 1955 with help from the Commonwealth fund. These efforts were unsuccessful and were abandoned, reportedly due to the difficulty of finding suitable stock and transportation. The LMB was created in 1976 and took over from CMB in 1977 with technical assistance from the Commonwealth fund. The objectives of LMB was to stimulate increased marketing of cattle to stabilize the herd numbers, ensure the farmer of a fair price in cash and provide the urban population with a sanitary meat supply at a fair price. Problems of undercapitalization, erratic livestock supply, and general inefficiency have been constant problems. While some tasks have been completed, the operation has never functioned successfully.

The objectives assumed that LMB could do these things more efficiently than the traditional private traders, agents, and butchers. These private middlemen have been accused, often unfairly, by government officials and donors of not paying enough money to the farmers/herders for their livestock and then charging the urban consumer an unfairly inflated price, thus taking an unreasonable profit for themselves. Several extensive marketing studies in west Africa have shown that these accusations have been unfounded and that the traditional system, in most cases, is very efficient and fair. There have been many projects and government efforts to improve on this system, none of which have proven successful in practice or by economic or social analyses.

This traditional marketing system depends on some traditionally accepted rules that the normally urban-oriented government officials and donors have not understood or accepted. That is, there must be a common respect and trust between buyer and seller to the point that the herder is willing to consign his animals to the trader and wait several weeks or even months before receiving payment (these actors are often family-related). That same trust and willingness by the seller and buyer is extended through the agents and butchers as previously described. The herder was essentially financing the marketing system. The LMB attempted to replace that system by financing agents who were to use the LMB advance to pay cash to the farmers/herders at a price originally set by LMB. These purchased livestock were to be collected at two LMB holding grounds for periodic transport by riverboat and later by truck to Banjul. LMB then offered these animals to butchers at the Banjul market. Originally the cattle were slaughtered at the old Banjul slaughter house which was replaced (with much resistance from the butchers) by the Overseas Development Assistance (ODA) financed central abattoir at Abuko (1978-79). Upon completion and implementation of the central abattoir operation, the butchers were required to slaughter at

the new LMB facility. This system has broken down because of poor supply to LMB from the agents and competition from other private sellers entering the Banjul market directly. Shortage of capital and high operating costs have influenced LMB to get out of the village-level livestock buying and transport. Now they are allowing free marketing and are only providing the required slaughter service at a below-cost price to attract the butcher who, on some occasions in the past, refused to pay the central abattoir price and deal with the long transport of carcasses from Abuko.

The central abattoir has had some functional problems that made sanitary conditions unacceptable. These problems have been corrected with the ODA-funded project rehabilitation of the Abuko central abattoir (1984). The inadequate equipment was supplemented, the killing floor and rails were extended, an office/inspector room built, and inspection personnel trained. Reportedly the abattoir can now function acceptably, even if at a loss.

The tannery discussed under the export section has been processing domestic hides and skins for the past three or four years to the "wet blue" stage (just prior to tanning) for export to Europe. Attempts to import raw hides and skins from Guinea Bissau and Mali have failed for the most part, leaving the plant underutilized. LMB has hopes of negotiating future imports, but they admit that the export price of the wet blue hides makes it difficult to buy raw hides and skins to expand the operation to a profitable level. Competition for raw domestic hides and skins by the traditional tanners and Senegal also limit their supply. The tannery requires only about 25 jobs for operation.

#### (c) Department of Livestock Services

Several short-term studies and consultancies have been conducted in support of animal and resource management, but the major projects only began in the late 1970s. The rural development project (livestock development component) funded by the Arab Bank for Economic Development in Africa (BADEA) (1977-82) worked with: (1) the DAHP to improve facilities, demarcate grazing routes, and provide funds for vaccination campaign; and (2) the LMB to develop buying points, scales, and vehicles for buying and delivering. The DAHP support improved some facilities and made some animal health care available for a short while, but very little long-term benefit is seen. The LMB activities have generally been regarded as failures as shown in the above discussion of LMB.

The animal health and production and livestock marketing project funded by German Technical Assistance (GTZ) (1979-1982) was designed to support DAHP and introduce a herder fee for animal health services, and to improve the functions of LMB. The

project had many problems including lack of acceptance of the herder fee and the LMB problems discussed earlier. Their own internal evaluation by Mol (1979) concluded that much of the planned project had to be abandoned.

UNDP provided an expatriate director of the Department of Animal Health and Production for four years from 1985 to 1989 for the purpose of reconstructing, reorganizing, and revitalizing the department. There is sufficient evidence pointing out that the department has been reduced to a minimum to carry out present functions. There are complaints of shortage of man power but the need to reduce the excess staff and become more efficient is accepted. It has reduced the staff from a high of 451 in 1986 to the present number of 218. The research unit is impressive and seems to have performed very well with the collaboration of the project help of MFP and now with GARD.

b. Current Interventions - DLS

The development of the sheep and goat production project supported by UNDP/GOTG has been active periodically since 1983. Efforts to develop a more productive herd of sheep and goats at Yundum by DAHP have been less than successful and now have been moved to the Yoro Beri Kunda (YBK) research station. A UNDP volunteer is conducting a village-level study on adaptation of improved housing, internal parasite control, and feeding crop residues. A visit to this site was very discouraging because no useful data were forthcoming. The GARD group might look into ways of helping and directing the volunteer in gathering more useful data.

Rangeland development and the production of land around livestock watering points funded by UNSO/UNDP from 1984-1989 has been testing deferred grazing with many of the same problems encountered by the range work of MFP. The future of the site is now being debated by the village elders. This project does not merit further support unless a monitoring system is designed and implemented to measure the effect of range interventions.

The Pan African Rinderpest project (1989-1991) funded by EEC is a regional project designed to control Rinderpest and improve the rangeland in 28 African countries. The Department of Livestock Service (DLS/formerly DAHP) will receive funds for vaccination campaign and strengthening in training, lab equipment, vehicles, and technical assistance. It is only just now starting.

## 2. Research

### a. Past Projects -DLS

The first big project directed at improving both crop and livestock management was the mixed farming and resource management project (MFP) funded by USAID (1980-1986). Much useful research was done on the natural resources available to livestock and their interaction with the cropping and social system. The project left several well-trained and experienced animal science researchers in the DAHP to carry on the research program. To extend the results of the research program to the farmers has been less successful, mainly because what was learned was that most technology available is not applicable under the village constraints. However, learning that for the present the traditional system is the best available is important so that future funds are not expended unwisely. (See the USAID Livestock Strategy for Africa, 1982). DAHP, with the help of GARD, is developing this information to identify ways of getting around those constraints and ultimately helping to increase livestock and crop production. Given the importance of the research results developed by MFP to further this learning process, the MFP should be considered a successful project.

### b. Current Projects

#### (1) Department of Livestock Services

The Gambia agricultural research and diversification project (GARD) (1986-1992) also has a livestock component that has the mandate to test, generate, adapt, and promote livestock production technology within the crop and livestock systems in The Gambia. They are to follow up on the work of MFP and develop new (or borrow network) technology and adapt or promote same under local conditions. GARD has done an outstanding job of helping DAHP/DLS researchers develop new studies and publish useful information from the MFP data and supplementary surveys and trials to fill missing gaps. They have identified potentially useful technology through these studies and network sources that are now being studied at the adaptation level in collaboration with others. These include sheep and goat management and health care, village-level poultry breeding, village-level poultry nutrition and disease control, draft-animal use and management (single ox, cow, donkeys, horses), crop residue utilization, and deferred grazing at water points. It is also recognized that technology exists and is available to commercial poultry producers, therefore, no specific research is planned in this area. Their problems are more associated with quality and price of feed supply, which is not considered appropriate or potentially productive research or extension topics. Both DLS and GARD should be supported to conduct identified village-level adaptive studies, to the point of having

good evidence to determine conclusively on a technical and socio-economic basis whether or not each practice has a real potential.

The 1989 GARD evaluation recommendation to move the livestock research division to the DOA is not considered to be advisable or workable, given the limited promotion opportunity available to a person in a department other than in his own field. However, a viable option may be to second both the livestock researchers and the crop researchers to a neutral department, such as "integrated farm research", which could be created as an independent unit.

## (2) International and DLS

The livestock development project funded by ABD/EEC/ODA/GOTG starting in 1983 is in support of the ITC located in The Gambia. While the ITC has an international mandate, the work they are doing has special significance to the Gambian livestock industry. They are primarily doing research on the disease, trypanosomiasis; the vector, tsetse fly; and the trypanotolerance of cattle and some collaborative studies on small ruminants (sheep and goats). All production aspects are being studied as inter-related factors (even side studies with trypanosomiasis in equine, which is important for draft power). The ITC facilities are being used by several universities doing special studies in support of the ITC research. The most interesting work to those looking for broadly applicable results is the village-level research, which is very extensive and some of the best observed. Station research is also an important part of their program and it is essential to support and accurately allocate some of the results or assumptions drawn from the village work. There are some station activities which should, and are, taking second priority, such as buying large numbers of males (over rational research needs) to fatten for market. This commercial component is being phased out this year. And, when possible, the station research environment should be as close to that of the village as can be simulated. The disciplines of research include epidemiology, nutrition, entomology, and animal production and management. The centre is also sharing its facilities with other special projects studying internal parasitology in both cattle and small ruminants. Both station and village work is done out of the three centre stations and all disciplines are represented by both expatriate and Gambian researchers. The facilities at each station are adequately equipped to support research. The comfortable living facilities are considered essential to attract good local and expatriate researchers and staff. This potential should be supported. Results to date are promising for both cattle and small-ruminant production increases.

### 3. Farm Level Development

Efforts to promote the use of animals for draft power as an integrated part of the "mixed farm" was started prior to 1919 with oxen training schools, draft power use demonstrations, implement introductions, and animal care instructions through the DOA. The Ox Ploughing School was started in 1955 by the DOA to further promote animal draft power and mixed farming, which has been considered very successful to date even though errors were made such as introductions of heavy implements and now, possibly, the failure to move with the initiative of the farmers to include equine in their training program.

Most of the projects discussed under institutional building had components to either promote or research some aspect of production at the farm level. It is significant that donors have not, for the most part, had ready packages in hand to go directly to the farmer. The donors are dependent on the local institutions to find or identify these appropriate "production packages" either through applied research or adaptation research and/or demonstrations. Therefore, no matter how confident the donors may be of new technology, the introduction should be made through a local institution, which requires support of that institute.

**CHAPTER IV**

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**A REVIEW OF FISHERIES DIVERSIFICATION PROJECTS**

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## CHAPTER IV

### A REVIEW OF FISHERIES DIVERSIFICATION PROJECTS

#### A. Objectives of Fishery Development Projects in The Gambia

The objectives of fishery development projects are basically the same as those for agriculture projects: to increase supplies of food, jobs, income, and foreign exchange. But at another level, objectives in fisheries are sometimes different from those of agriculture, where activities are designed to increase the productivity of the soil and thus the yields per unit area. In ocean fisheries and in capture fisheries in fresh water, the resource size has an upper limit. This limit may change from year to year, as a consequence of climatic and other influences on the nutrient content of the water, but the limit cannot in practice be increased by any actions of man. As a consequence, the objective of fisheries development in the capture fisheries is to improve production only where the stocks are under-exploited. Where stocks are fully or over-exploited, the objective is to create a system for extracting the maximum amount of food and income from the existing resource while ensuring that the resource base is maintained at a reproductively satisfactory level (the "optimum yield").

The following are strategies and interventions that could be applied in The Gambia to increase or maintain the level of harvest of fish from wild stocks. These strategies would help The Gambia increase their food supply and bring needed revenue to the economy. A different strategy is appropriate for aquaculture, which needs strategies similar to those employed in agriculture.

- o More fishing effort (more boats and improved gear); some expansion is also possible in some parts of the Gambian artisanal fishery; and a substantial under-exploited pelagic resource exists offshore.
- o Proper management and regulation can restore stocks depleted by overfishing, especially from offshore demersal fishing.
- o In cases where a fishery is operating on fully exploited stocks, management can maintain catches at maximum sustainable levels by guarding the current production.
- o Reduction of spoilage and other post-harvest losses.
- o Development of the capacity to harvest, process, and sell the fish available in its offshore waters.

o Aquaculture.

(See annex B for more details on these strategies and interventions.)

B. Characteristics and Status of the Gambian Fisheries

1. Size of the Resource

Statements about Gambian fishery resources usually note that they are "rich" or "abundant." There are several geographic and environmental factors that tend to increase the abundance of aquatic organisms, among the most important being the existence of upwelling areas in the sea and rivers.

The size of exploitable fish populations in the sea depends on the nutrient content of the water, in particular nitrates and phosphates in the surface layer where photosynthesis by plant plankton takes place. Organic material of plant and animal origin sinks after the organisms die, and becomes trapped in a cold and dense water layer below a region in the water column called the "thermocline," where a rapid drop in temperature takes place. In mid-latitudes this leaves surface layers relatively sterile, and results in lower fish catches in many tropical waters compared with those in temperate oceans. The principal exceptions are areas off the west coasts of continents where offshore winds skim the warm, nutrient-poor waters off and allow deeper waters to well to the surface. These cool deep waters carry nutrients and start a biological cycle of plant and animal plankton, which culminates in various kinds of fish at several levels of the food chain.

Such upwellings support some of the great fisheries of the world, including those for anchovies and sardines off Chile and Peru, and the rich fisheries off the Pacific coast of North America. A strong upwelling takes place in the ocean off the west coast of Africa (Morocco, Mauritania, Senegal, and The Gambia).

Rivers increase the fertility of ocean waters with the nutrients they carry from the land. The mixture of fresh and salt water creates an estuary, a special ecosystem of high productivity at the edge of the sea. The Gambia possesses this valuable asset and its river (and lesser water bodies) covers about 20 percent of the land mass of the country. The Gambia River provides the breeding, nursery and feeding areas for a great number of the nation's economically important fishery resources, including two of its most valuable: shrimp and a shad fish called bonga. The river also supports populations of fish and other freshwater organisms, many of which have economic value.

But while The Gambia benefits greatly from these geographical and environmental circumstances, the smallness of the country and of the ocean area under its exclusive control make it difficult for the nation to profit fully from them. In the first place, the size of the market for fish and the low buying power of the people make it hard to erect and operate a profitable national fish production, processing and marketing industry. Secondly, a profitable ocean fishery, especially one exploiting the more valuable demersal (bottom-dwelling) species requires a large volume of catch, usually over larger fishing grounds, mostly within 30-40 miles of the coast. As rich as the Gambian grounds are, they are much smaller than the areas over which most profitable trawler fisheries operate.

## 2. Importance of Fish in The Gambia

Fish plays an important and sometimes underestimated role in the economy and food security of The Gambia. Apart from agriculture, fishing and its supporting activities are the main occupations of the rural population along the coast and the river. There are estimated to be between 1,200 and 3,200 fishermen in the artisanal fishery. Table 7 shows that large numbers of other workers are directly or indirectly supported by the fishery: hawkers (banabanas), smokers, driers, distributors, retailers, and others.

Table 7. Total Number of Fisherman in the Gambian Artisanal Fishery 1981-1988

Year	No of Fishermen	Gambian	Foreign
1981	2639	1867	1272
1982	no survey		
1983	3190	1896	1294
1984	3206	1870	1336
1985	2716	1804	912
1986	2017	1201	816
1987	1250	684	566
1988	1582	928	654

Source: Fisheries Department

The income of fishermen and other fisheries workers is substantially greater than that of farmers. For example, bonga fishermen are reported to make from D700-1000 per month, smokers as much as D2500 and fish driers D500 per month. In the river fishery a good fisherman with good gear can earn D1000-1500 per month in the high season and D500-700 in the poorer months; good fishermen earn D10,000 to 15,000 per year, and the least skilled D5,000 to 6,000. This compares to a reported income by a good farmer of about D800.

Fish provides a highly significant part of the nutrition of the Gambian populace (unfortunately considerably below minimum desirable standards). While suggested minimum calory requirements by World Bank standards are 2,230 per day, the Gambian figure is 1,800, or only 81 percent. The suggested total protein requirement is 60 g. per day, of which it is suggested that 10 g. should be from legumes and 10 g. from fish. In The Gambia the animal protein intake is reported to be 21 g. per day, but without fish, this number would be much lower. Beef provides 3.8 g. of this requirement and all meats 7.6 g. (See also table 3 in chapter 3.) Fish provides 19 g, almost twice the suggested target for this commodity. Fish is thus by far the greatest source of animal protein in this country.

Furthermore, fish protein is much cheaper than other kinds of animal protein, an important consideration in a country where many people are impoverished. Beef costs D15-20 per kg. while the most common kind of fish, the bonga, costs D2-4. In general, beef, fowl, goats, and sheep are 5-10 times as expensive as bonga.

The annual per capita consumption of fishery products is reported by FAO to be 21.4 kg. for the urban population and 18.0 kg. for the rural. This is high by international standards.

Fish generate significant foreign exchange for The Gambia. Smoked and dried fishery products from the artisanal fishery are exported to many nearby African countries; frozen fish are processed and exported to Ghana and other markets from the offshore pelagic fishery; demersal fish caught under licence by foreign vessels are processed at sea and marketed abroad; and shrimp are raised on farms, processed locally, and sold in Europe and elsewhere. All of this generates foreign exchange for The Gambia, but as will be discussed later, the amount of this income should probably be greater. (See table 8.)

Table 8. Export of Fish Products and Fish

Year	Fish and Fish Products in Tons	Value in Dalasis 1000
1974/1975	12767	2564
1975/1976	14505	4830
1976/1977	20411	7622
1977/1978	16712	8651
1978/1979	13039	3651
1979/1980	10944	4364
1980/1981	7943	6359
1981/1982	9162	4597
1982/1983	5006	3191
1983/1984	5734	4098
1984/1985	5741	5039
1985/1986	7598	6775
1986/1987	5304	6543
1987/1988	3793	13741
1988/1989*	1163	1961

(\$1 U.S. = D7.70 for 1989)

\* Partial year

Source: Fisheries Department

A Gambian government public investment program document states "...expansion of the fishing industry is an important component of the national strategy for diversification of agriculture."

Fish therefore constitute an important economic and nutritional resource for The Gambia. But it is a uniquely

fragile resource, and the industry that it supports is difficult to control. This is fundamentally because it is a wild natural resource whose size and seasonal availability are to a significant degree beyond the control of man. Special wisdom and political determination are therefore required to make the optimum use of it.

### C. Structure of the Gambian Fishing Industry

The Gambian fishing industry is composed of four sectors, artisanal: industrial, shrimp, and aquaculture.

#### 1. The Artisanal Fishery

The active artisanal fishery is the most important sector in the Gambian fishing industry, producing more fish and income by far for the local populace than the industrial fishery or the infant aquaculture industry.

The artisanal fishery is composed of many small fleets in three geographic sectors. The biggest of these is that fishing along the marine coast; the others are a sizeable fishery in the lower river (the estuary), and the small fishery in the upper river.

The artisanal fishermen use canoes with gillnets. In the upper river the canoes are dugouts of about 6 meters in length. On the coast and in the estuary, the canoes are planked, from 7-14 meters long. On the marine coast, drift and set gillnets are used for demersal fish, and gillnets are used for bonga. Beach seines, handlines, and castnets are less commonly used. In the estuary these same gears are employed, and in addition stow nets are used to catch shrimp. These are passive gears attached to the canoes, fished on the receding tide. They capture the shrimp that drift into the large opening of the net.

The numbers of fishing units (canoes/gears/ crew) were estimated in frame surveys conducted in various years. (See table 9 on the following page.)

Many of the fishermen are from Senegal; others are from Ghana and other foreign countries. By agreements with Senegal in 1967 and 1984, artisanal fishermen from The Gambia and Senegal have free access to the waters of the other country, subject to the regulations of the host. Senegalese fishermen in The Gambia are well integrated into this country, and an estimated 600-700 fish here. There are also about 100 fishermen from Ghana in The Gambia.

Table 9. Number of Canoes - Frame Surveys 1981, 1983-1988

Year and and Location	Motorized			Non-Motorized		
	Gambian	Foreign	Total	Gambian	Foreign	Total
1981						
Atlantic Coast	69	254	323	91	76	167
Lower River	75	23	98	222	62	284
Upper River	1	-	1	71	100	171
Total	145	277	422	384	238	622
1983						
Atlantic Coast	73	188	261	85	51	136
Lower River	61	37	98	482	155	637
Upper River	1	0	1	67	99	166
Total	135	225	360	634	305	939
1984						
Atlantic Coast	72	171	243	95	52	147
Lower River	86	21	107	474	132	606
Upper River	1	0	1	92	143	235
Total	159	192	351	661	327	988
1985						
Atlantic Coast	73	161	234	85	33	118
Lower River	71	19	107	645	114	759
Upper River	1	0	1	72	129	201
Total	145	180	342	802	276	1,078
1986						
Atlantic Coast	68	156	224	85	37	122
Lower River	60	18	107	538	102	640
Upper River	1	0	1	99	138	237
Total	129	174	332	722	277	999
1987						
Atlantic Coast	76	184	260	120	40	160
Lower River	68	33	107	580	148	728
Upper River	2	1	3	70	176	246
Total	146	218	370	770	364	1,134
1988						
Atlantic Coast	59	208	267	86	72	158
Lower River	38	44	107	358	103	461
Upper River	1	0	1	83	130	213
Total	98	252	375	527	305	832

Source: Fisheries Department

## 2. The Industrial Fishery

This fishery operates offshore, employing trawlnets for marine demersal (bottom) fish including croakers (Sciaenidae), sea bream (Sparidae), triggerfish (Balistidae), hake (Gadidae), cuttlefish and squid (cephalopods), and others. Purse seines are used for pelagic (midwater) fish, principally sardinellas Sardinella and sardines, and horse mackerel; lesser quantities of mackerel (Scomber), barracuda, and carangids are also captured. Florida-type shrimp trawlers have begun to fish near the river mouth in recent years .

The offshore fishing takes place in the Gambian EEZ, which was created when The Gambia declared the existence of a 200-mile fishing zone in 1978. In this zone The Gambia has exclusive control over fishing, an action authorized by the Law of the Sea Treaty. The width of the Gambian coastline, including the river mouth, is about 32 nautical miles, so that the area of ocean controlled by The Gambia is about 6,400 square nautical miles. This is about 14 percent of the combined Gambian/Senegalese shelf area. Most of the productive fishing, except that for tuna, is done within 30-40 miles of the coast.

It is important to note that in addition to the right to enjoy the harvest from the EEZ, by signing the treaty and invoking the treaty rights, The Gambia also undertook to "protect, preserve and manage the marine resources of the zone." This places a responsibility on the nation to control fishing and other activity in the Gambian EEZ in a rational way, something the nation has done only to a limited extent so far.

The offshore industrial fishery started in 1971 when 11 Senegalese trawlers fished for two years. In 1972 a joint venture involving a firm from Ghana, Mankoadze (51 percent), and the government of The Gambia (49 percent) began to fish for pelagic stocks. This company, now called Seagull Fisheries, processes the catch from a fleet of Norwegian vessels (which it does not own or operate, and which is crewed mostly by Ghanaians.) This fleet catches sardinella, freezes the fish in a plant in Banjul, and ships it to Ghana and some other west African markets. (See table 10.)

Table 10. Number of Vessels Operating for Seagull Fisheries, 1978-1988

Year	Purse Seiners	Trawlers	Storage Freezers	Total
1978	7	4	1	12
1979	6	2	1	9
1980	7	-	-	7
1981	6	-	-	6
1982	6	-	-	6
1983	3	-	-	3
1984	1	-	-	1
1985	2	-	-	2
1986	1	-	-	1
1987	4	-	3	7
1988	4	-	3	7

Source: Fisheries Department

In 1977 the government of The Gambia created the parastatal Fish Marketing Company (FMC), taking over two trawlers and other assets of a Japanese company that had operated briefly. The FMC was given the authority to issue licences to foreign firms to fish in Gambian waters. It was short-lived because of management difficulties, and it died in 1979. It was reorganized and revived in 1986 with the creation of the Fish Processing and Marketing Company, financed by the a \$10 million loan from the African Development Bank and the government of Norway. This operation has also been a failure.

In 1979 the National Partnership Enterprise, a privately owned Gambian company, was formed. It produces, processes, stores, and sells shrimp and sole, for local consumption and export. It buys shrimp from the artisanal canoe fishermen, and

in 1986 it bought two Florida-type shrimp trawlers. (See table 11.)

Table 11. Number of Contracted Vessels by the National Partnership Enterprise Ltd., 1980-1988

Year	No of Vessels
1980	3
1981	3
1982	5
1983	13
1984	9
1985	7
1986	5
1987	9
1988	7

Source: Fisheries Department

In 1982 two Danish trawlers were brought to The Gambia on loan. They operated for a year with support from DANIDA using Danish skippers and engineers. When these men left, the operation ceased.

In 1982 the Lyefish Company, a privately owned Gambian firm, began operations. It has a complex in Bakau, with a small ice plant, refrigerated holding rooms, a blast freezer, and other facilities. The company operates a brokerage business, buying shrimp from canoes fishing in the river and fish from trawlers, and selling to local and export markets. Lyefish has engaged in joint ventures with foreign producers. Expanded facilities in another location near Banjul are under construction.

In 1987 Gambia Marine Products Ltd., a Gambian-Swedish joint venture, began operating a plant at Banjul. The catch of shrimp and solefish from a small trawler, and shrimp from about 100

canoes are processed. Capital is being sought to purchase more trawlers.

Foreign vessels can be licenced to fish in Gambian waters in two ways: under the terms of a bilateral agreement with The Gambia, or by creating a joint venture with a Gambian firm. According to the Gambian government five-year development plan, fishing licences may be given to "bonafide Gambian companies that have made relatively large investments in the sector." These licences can be allocated to foreign vessels that have joint ventures with the Gambian companies. The limit placed on the number of such licences is based on the size (and therefore the approximate fishing capacity) of the vessels, and is fixed according to the judgement of the Department of Fisheries in relation to the current estimates of maximum sustainable yield. There is no statutory limit to the number of licences that can be issued.

The Gambia has bilateral agreements with the EEC and with Senegal. As a result of the first of these, signed in 1987, trawlers, tuna vessels, and purse seine vessels can be licenced to fish in the Gambian EEZ, according to total tonnages for each class of vessel as set out in the agreement. In payment for this, the EEC agreed to give The Gambia 3,300,000 ECU over three years, and the owners of the vessels pay this country 2 ECU per ton for tuna and a flat rate per vessel-ton for trawlers. In addition the EEC agreed to pay 80,000 ECU to fund Gambian science training.

As part of a special arrangement linking Gambia and Senegal in respect to several economic and political ways, five trawlers, 10 purse seiners, and 12 tuna vessels from each country are permitted to fish in the EEZ of the other. (The number of trawlers used to be 15 but was reduced.)

The regulations governing the operations of the EEC and Senegalese vessels, under their respective agreements, differ from the regulations controlling other foreign vessels.

There are 2-3 Nigerian vessels with licences obtained by joint-venture arrangements with a Gambian firm. Under the same kind of permission, there are 12 Korean vessels fishing for squid and cuttlefish under the Gambian flag through arrangements with the Lyefish, Mosham, and National Partnership Companies. One-two Greek vessels, one Chinese vessel associated with Zhomgam, a Chinese-Gambian joint venture, one Spanish vessel, and two Ghanaian vessels are fishing for Seagull.

There were 66 foreign fishing vessels operating in the Gambian EEZ in 1987 (the latest year for which data are available). None of these is Gambian owned, but those foreign

vessels associated with Gambian companies may fly the Gambian flag. (See table 12.)

Table 12. Number of Licensed Fishing Vessels in Gambian EEZ

Year:	1980	1981	1982	1983	1984	1985	1986	1987
Vessel:								
Trawlers	6	5 1/2*	13	18	20	28	51	54
Seiners/ Longline	-	5	5	3	-	1	3	12
Freezers	-	1	1/2	-	-	-	1/2	-
Total	6	11 1/2	18 1/2	21	20	29	54 1/2	66

\* Some licences issued for partial years

Source: Fisheries Department

The only foreign exchange gained by the country from the offshore resource derives from licence fees paid by the foreign vessels; in a few cases additional income comes from employment at the processing plants in Banjul and the consumption by those plants of fuel and other requirements.

Foreign fishing activity on the demersal populations has apparently been too intense, damaging the stocks. The degree to which this is true is unfortunately not known. As shown in table 13, several estimates have been made of the maximum sustainable yield (MSY) of the several exploited stocks.

Table 13. Estimates of Fish Biomass and Potential Yields in Gambia EEZ and in The Gambia River

Type	Estimated Biomass	Potential Annual Yields in Tons	Catch 1983
Pelagic fish (1) excluding bonga	61,300	18,400-30,650	5,500
Bonga	no estimation	10,000-12,000	5,700
Demersal Fish	46,300 (3)	8,000	8,979
Crustacea	no estimation	400 (2)	312
Miscellaneous Cephalopods, Shellfish, etc.	no estimation	400	--

(1) According to Levenez, J.J., 1984, the yield is estimated to be 30% to 50% of the biomass

(2) Including the shrimp catch from the River Gambia

(3) Scheffers, W.J., "The Fishery Resources of The Gambia, Development 1976 of Inshore Fishery, The Gambia", GAM/72/006 Project Technical Paper No.1.

Source: Robinson, 1985, and Department of Fisheries

These estimates can lead to determinations of the probable safe allowable catch, the foundation of rational fishery management. If the MSY is wrongly estimated, if the catches are falsely reported, or if quotas are ignored, the stocks can be overfished. Determination of the proper level of fishing effort depends on the availability of trustworthy data on catches and fishing effort. Such data are inadequate, partly because of incomplete reporting by foreign vessels. The Gambia does not have the financial or manpower resources to correct this situation at the moment.

Everyone consulted on the matter, in the government and industry, agreed that too many licences have been issued for fishing in the Gambian EEZ. Government policy states that "the number of licences will be limited," but apparently no specific legal limit has been established, and no catch quotas are imposed.

Records of the catch of foreign vessels operating in the industrial fishery are incomplete and inaccurate. No statistics for this sector existed before 1977. Table 14 presents the available data, with catches from the other two sectors.

Table 14. Total Catch in Metric Tons, 1971-1988

Year	Marine Artisanal	Freshwater Estimate	Industrial	Total
1971	5,800	800	5,000	11,600
1972	6,000	800	5,200	12,000
1973	10,400	800	9,600	20,800
1974	10,795	800	9,995	21,590
1977	13,295	2,700	N/A	N/A
1978	11,999	2,700	273	14,972
1979	8,443	2,795	159	11,397
1980	10,565	3,489	310	14,364
1981	11,368	1,423	313	13,104
1982	6,512	3,508	316	10,336
1983	8,953	2,500	498	11,951
1984	9,182	3,500	N/A	N/A
1985	8,012	3,500	17,058	28,570
1986	9,906	3,500	16,861	30,267
1987	5,049	3,500	13,417	21,966
1988	7,224	3,500	11,834	22,558

Source: Fisheries Department

The figures for the offshore industrial fishery are hard to interpret since there are no fishing effort data, but unprofitability of some operations and the consequent departure of vessels, as well as anecdotal evidence, suggest that the demersal stocks are overexploited, perhaps severely. Most knowledgeable persons expressed the view that most stocks were overfished, with only a few species, including the triggerfish, being able to sustain increased catches. Opinions included the view that the resources were irreparably damaged, but it seems likely that appropriate management can restore them.

Table 15 shows catches by the fleet fishing for Seagull Fisheries since 1977, the first year that data are available. The data exhibit a steady decline over the years. In the absence of other information this might be interpreted as showing strong depletion of the sardinella stocks on which this fishery operates. But fishing effort and catch-per-unit-of-effort data for 1980-1985 (table 16) show that fewer boats operated and less fishing took place over succeeding years, and that the availability of the fish in the most recent years may not be significantly less than at the beginning of the period. The reasons for the reduced effort, according to officials of Seagull, have been "operational" and "business-related problems in the plant," and due to problems with foreign exchange.

Table 15. Pelagic Fish Processed by Seagulls

Year	Fisheries Department
1978	14652
1979	10136
1980	8242
1981	9301
1982	6359
1983	4894
1984	4533
1985	9426
1986	4820
1987	9529
1988	6791*

(\*) June - December

Source - Fisheries Department

Table 16. Catch in Tons, Effort, and Catch per Unit of Effort, Seagull Purse Seine Fleet

Year	Catch	Effort		CPUE	
		No. of Trips	No. of Days Fishing	Catch per Trip	Catch per Days Fishing
1980*	3096	88	163	35.19	18.99
1981	4726	179	311	25.40	15.20
1982	5957	157	334	37.94	17.84
1983	4894	128	257	38.24	19.04
1984	4488	69	193	65.04	23.25
1985**	2747	30	107	91.57	25.67

(\*) June-December

(\*\*) January-June

### 3. The Shrimp Fishery

This fishery is prosecuted by two kinds of gear. Shrimp are caught in passive gears called stow nets, attached to anchored canoes fishing in the lower river on the outgoing tide. There may be between 200 to 300 canoes engaged in this fishery; the exact number is unknown but is increasing.

The other gear is the trawl, fished on grounds off the river mouth by Florida-type vessels such as those used in the United States and Mexico. There are between two and five such vessels fishing at various times.

The species caught is mainly the pink shrimp, Penaeus notialis (or duorarum), the same or a closely related species to that supporting a very large fishery in Florida and parts of the Caribbean. A smaller shrimp, Parapenaeopsis atlanticus, is also caught in small quantities. Most of the catch is frozen in Banjul for export; some goes to the local market, principally for the tourist trade.

The landings reported for this fishery have shown a general increase during the 1980s, but the accuracy of the data is in doubt (table 17). Information is missing that would permit an analysis of the status of the shrimp stocks, and there is uncertainty as to whether they are overfished. It may be significant that the fishermen, who are usually the first to point out declines in abundance, have not complained about reduced catches. But it is apparent that the status of the shrimp stocks requires attention.

Table 17. Shrimp Production in Gambian Waters in Metric Tons

Year	Catch	Year	Catch	Year	Catch
1972	88	1979	--	1986	848
1973	260	1980	356	1987	350
1974	183	1981	275	1988	526
1975	183	1982	316		
1976	183	1983	312		
1977	--	1984	504		
1978	--	1985	615		

Source: 1972-1980, FAO, 1984  
1981-1988, Fisheries Department

#### 4. Aquaculture

It is sometimes said that the system for producing human food from fish and other aquatic organisms is 1000 years behind that from terrestrial sources, since fish production is still in a hunting stage while land food production is almost exclusively by culture on farms and ranches. The fisheries food sector should therefore pull out of its primitive state and turn to fish farming.

This kind of statement is to some degree true, as is the accompanying criticism. The fundamental differences between terrestrial and aquatic production systems, sketched briefly above make it certain that the apparently primitive hunting techniques must continue to be used to produce most of the fish

consumed by man. But some kinds of fish farming have been employed for over 1000 years in China and elsewhere, and some farming systems have reached a high degree of sophistication.

There is no doubt that far more food could be raised by aquaculture, on the edge of the sea and in fresh water, and indeed there has been significantly greater effort expended in the last few decades to expand and improve farming systems for aquatic food organisms. Commercial fish culture is of great economic and nutritional importance in many countries, especially in Asia; mollusc culture produces significant tonnages in southern Europe, North America, and other areas, and the shrimp culture is becoming profitable in some South American, Asian, and other countries with warm climates. As stated earlier, worldwide aquaculture production leads that of fishing for wild stocks. The substantial potential of fish farming has caused the influential Consultative Group on International Agriculture Research (CGIAR) to consider the necessity of creating an international center for aquaculture research, perhaps designed along the lines of their highly successful agriculture international research centers.

Aquaculture has been attempted on a small and very tentative scale in The Gambia, so far without proven economic success.

## 5. Fish Culture

No fish farming operations exist in The Gambia. Trials with fish ponds were made at Bintang, with poor results, and experiments on pond culture of tilapia were made in 1979-82 at Bansang but they were unsuccessful.

### a. Oyster Culture

Oyster culture trials were made in 1979 on a small scale. A research project is now under way with the support of IDRC.

### b. Shrimp Culture

Shrimp are high-priced, and enjoy a strong market. As a consequence they are a favorite target for culture. It is only in the last three decades that the technology, developed first in Japan, has existed to make shrimp farming possible. Many of the attempts have failed, for a variety of environmental and technical reasons; but like any other farming activity, failures are usually related to lack of profitability even if good technology is used. A major shrimp farming operation under development in The Gambia is described in the next section.

## D. Fishery Development Programs

### 1. Artisanal Fisheries Development Project

The most active development project in the fisheries sector in The Gambia, and probably the one with the greatest impact, has been a pilot project for the improvement of facilities and assistance to fishermen, processors, and others involved in the artisanal fishery at the Atlantic coast village of Gunjur. An extension of this project is under way, providing similar help to four other villages on the coast.

This project was funded by the Economic Development Fund (EDF) of the European Economic Community (EEC), and started in 1979. The objectives of the project were stated to be "...to increase fish production and exports, in order to increase local consumption of fish (especially in rural areas), to generate export revenue, and "to create employment, diversification of the economy, and improvement of socio-economic standards."

The project concentrated on the improvement of facilities. These included: (1) creation of a fisheries center at Gunjur, with drying racks, improved smoke ovens, a workshop for maintenance of engines, running water, storage lockers for fishermen's gear and motors, and storage space for fish; (2) construction of an ice-making plant at Brikama; (3) roads to the landing sites; and (4) bridge improvements at the village of Tanji. Technical assistance, including trials with several kinds of fishing gear, was provided as training of fishermen and processors. A revolving loan fund was strengthened to provide credit to fishermen and processors.

This project has had considerable favorable impact on the artisanal fisheries sector. It is described with enthusiasm by those responsible for its implementation, and the impression received from some limited contact with fishermen and processors at the villages indicated support for the effort and the results.

Production of fish from the marine sector of the artisanal fishery have declined in recent years (table 14). Officials state that this is a result of the movement of some Senegalese fishermen from the Gambian fishery because of subsidies granted to them in Senegal, and by the shift of some Gambian canoes to the lucrative shrimp fishery in the estuary.

Table 18 shows that the landings at Gunjur, where the artisanal fishery development project was focused, have increased, somewhat unevenly, since records began to be collected in 1981.

Table 18. Landings at Gunjur, 1981-1988

Year	Tons
1981	2,673
1982	-
1983	2,898
1984	-
1985	3,107
1986	2,131
1987	1,864
1988	3,709

Source - Fisheries Department

There has been an improvement in the quality of the fish produced at Gunjur, both fresh and processed, and post-harvest losses of fish have been reduced. Not only has this increased the amount of food available to consumers, but it has encouraged fishermen to fish longer and oftener since they have facilities where extra catches can be stored temporarily. The increased use of ice has contributed significantly to this, and the impact would have been greater if the planned capacity (15 tons per day) of the Brikama plant had been realized; only 5-6 tons per day were produced, and this fell short of needs. Further, the siting of the plant at Brikama instead of as planned at Gunjur, caused loss of time in transporting ice, and waste through melting. The improvement in transport (bicycles and motorbikes principally) and the provision of roads permitted the more rapid and extensive distribution of fish.

## 2. Integrated Artisanal Fisheries Development Project

This project was designed as a complement to the EDC/EEC project described above. It started in 1983, with the financial support of the Italian Aid Fund (FAI). Two river villages, Kemoto and Tankular, were targeted because of their isolation from the rest of the country and their low level of development.

The objectives were to increase the production and incomes of the artisanal fishermen, to improve the marketing and distribution network, and the consumption of fish, particularly in the rural area, and to increase employment.

Like the EEC project at Gunjur, this inland village project is regarded by observers as successful. Catches and income are said to be higher, but statistics are scanty. The quality of fresh and processed fish is said to be better as a result of the

project, and the methods employed more efficient. Fish are more widely distributed. But transport is still a major problem, and losses through spoilage are still high. Vehicles provided to help overcome this were poorly maintained and one was wrecked; so their effectiveness was largely lost.

A follow-on project has been launched to extend similar activities to five more villages on the river: Bintang, Tendaba, Albreda, Kerewan, and Salikene.

The conclusion is that the two artisanal fisheries development projects described above have benefitted the fishermen and the other people involved, and they have increased the distribution of fresh and processed fish, thus making it more widely available to Gambians. There is reason to believe that the project effects will continue to be felt, in a widening ripple of change. But there may be unwelcome costs to the GOTG from these projects in the future, if the rents being charged to the fishermen, smokers, and dryers do not generate enough income to maintain and replace these facilities.

### 3. Experts and Equipment to the Fisheries Department

This project was funded by the government of Japan (JICA) over the years 1985-1988. It supplied two experts and mechanical equipment to provide mechanical training for maintenance and repair of outboard engines in the Fisheries Department. It accomplished its objectives.

### 4. Fellowships in Fisheries

In 1987 JICA paid the expenses for a Gambian to attend an engineering course on coastal fishing gears and methods in Japan.

#### a. Aquaculture Development Projects (Shrimp Farming)

ScanGambia, a subsidiary of Scanaqua, a Norwegian corporation, with a small additional involvement by private Gambian investors and a grant of land on long-term lease by the Gambian Government, has invested approximately US\$10 million in an ambitious project.

The ScanGambia shrimp farming operation includes a large and well equipped hatchery at Sanyang and 54 ponds occupying 217 ha. at Pirang, with a pumping station, an ice-making plant, and other facilities. These ponds were not constructed in mangrove areas, but in flats back from the river. A smaller hatchery at mile 5 near Banjul serves as a backup facility.

The ponds are designed to produce 600-800 tons of shrimp per year, and the hatchery has over-capacity to stock the existing

ponds (45 million postlarvae per year). The first trials were with the local pink shrimp, Penaeus notialis, but growth was slow and the Asian tiger shrimp, P. monodon, is now raised. Broodstock has been imported from Malaysia.

This is a pioneering farm operation, the first for shrimp in the whole of Africa. Even though the technology for shrimp raising is well advanced in several parts of the world (for example, there are 1,500 shrimp hatcheries in Taiwan), local conditions vary so much from place to place that unexpected problems always arise in attempting to adapt the technology to a new location.

The introduction of the tiger shrimp, a non-native species, like the introduction of any exotic, is environmentally risky, involving the possibility of introducing disease, parasites, and other problems. In addition, it was discovered that the quality of the first broodstock was poor.

Less than ideal water temperatures have proven to be a constraint, since the tiger shrimp grows best at temperatures above those that prevail here in the winter. As a consequence only two crops of shrimp can be raised in a year to market size, instead of the two and a half projected when the project was designed. This and other environmental problems in the hatchery have resulted in production falling behind schedule.

Another potential environmental threat faces the shrimp farming project: spraying with insecticides against swarming locusts. Shrimp are extremely vulnerable to the same insecticides that are effective against insects, and whole shrimp crops could be wiped out by the spray. The Department of Agriculture does this spraying when locusts threaten, and while department officials have been cooperative in realizing the devastating effect that locust spraying could have on shrimp production, ScanGambia officials are concerned that a choice may some time have to be made between land crops and shrimp if a serious locust attack threatens.

Another difficulty besides those mentioned above is a severe shortage of adequately educated and trained local personnel. This and the other problems discussed are gradually being overcome, according to company officials, but the ultimate financial success of the operation is still in doubt. This is especially the case in the immediate future, in the face of a recent drop in shrimp prices.

#### b. Fish Culture

An abortive attempt was made to raise tilapia in ponds at Bansang in 1979-82. Problems faced related to the construction of the ponds, and their water supply. It was

concluded that intensive culture of this species would be economically viable only on an industrial scale and not in small farm ponds as a supplement to the activities of the small farmer-- a successful mode in Asia.

A proposal has been prepared to test tilapia farming in certain low-lying areas of the Jahaly-Picharr irrigated rice culture project. These particular areas are under water for most of the year, but during dry years and in certain months, some irrigation with the existing rice irrigation system would be necessary. About 10 ha. of land in the project area might prove better suited to fish than to rice farming, according to the manager of the Jahaly-Picharr project.

### c. Oyster Culture

Oysters (Crassostrea gasar or C. tulipa) occur in large numbers in the mangrove areas of The Gambia. They are small, and the cost of collecting and distributing them exceeds the selling price in the present markets. In many countries in the developed and developing world most of the oysters produced come from cultured stocks. A survey by oyster specialist John Shelbourne in 1976 led him to conclude that there do not appear to be any biological reasons that oyster culture could not be successful in The Gambia. The product is expensive and would add little to the food supply of the local populace, but a market exists in both the local tourist industry and the export industry.

The oyster culture project is being conducted by the Fisheries Department with funding and technical assistance from the International Development and Research Corporation of Canada (IDRC). It has been under way since 1986 and has recently been extended until 1990.

The objectives of this project are to develop a culture system that can be used by a small oyster farmer at the artisanal level. Results so far have been disappointing. Using rack culture, growth rates of oysters has been slower than those in a project in Sierra Leone, where rafts are used. Mortality rates in the first month have been high.

It would appear that even if growth and mortality rates were more favorable (and experience and skill might make this possible), it seems likely that the volume that could be produced by farms this small would not be great enough to attract and keep markets, and the product is too expensive to be a subsistence crop. Profitable oyster culture projects in most parts of the world are on a considerably larger, industrial scale.

## 5. Industrial Fisheries Development Projects

### a. Resource Surveys

Table 19 on the following page shows that a series of research and stock assessment cruises were made in Gambian waters by vessels of several nations and agencies, starting in 1952; the last of these was apparently in 1984.

These cruises laid the foundation for knowledge of the fish and other fauna, and the geology and oceanography of the ocean off the coast of The Gambia. Some of these cruises also performed the essential task of collecting data necessary for estimating the maximum sustainable yields of the exploitable stocks. In view of the considerable time that has elapsed since the last of these cruises, it would be desirable to have new estimates of MSY made.

### b. Fish Processing and Marketing Company

The major development project undertaken in the industrial fisheries sector in the recent past was an attempt to revitalize the failed parastatal Fish Marketing Corporation (FMC). The latter organization was created in 1977 when GOTG acquired the assets of a Japanese operation (a freezer/cold store of 200-ton capacity and two fishing vessels). Financial and other assistance was given through an FAO/UNDP project.

The demise of the FMC was swift (two years), and might have been predicted given the fact that the company it bought out (Gambia Fisheries, Inc.) was itself a failed business enterprise, and in view of the poor record of other parastatal companies. The reasons are familiar: lack of commitment and resolution by non-owning managers, and bureaucratic delays and inefficiency.

The attempt to revive the FMC was supported by a \$10 million loan from the African Development Bank and the government of Norway. A new entity was created called the Fish Processing and Marketing Company (FPMC). It acquired the assets of the FMC: the freezer/cold storage plant, a jetty, and four vessels (two trawlers donated by the Japanese and two dual-purpose vessels loaned by DANIDA). FPMC planned to produce, process, and market fish products, creating a vertically integrated company. Consulting services and training were also to be provided.

The FPMC faltered from the beginning, falling far behind in meeting its goals, and suffering from the same handicaps inherent in parastatal management as the FMC. The FPMC folded when the creditors of the GOTG insisted that the government give up its role in the ownership and management of the company. The company was unsuccessfully offered for sale.

Table 19. Resource Surveys and Scientific Expeditions Carried Out in Gambia Waters

Vessel	Area	Year
Akademik Knipovich	Sen. Gam.	1970
Alferas	Sen. Gam.	1969
Belogorsk	Sen. Gam.	1975
C.S.S. Baffin	Sen. Gam.	1976
Cape St. Mary	Sen. GB. SUI. SL. Lib.Gam	1952- 57
Capricorne	Sen. Gam.	1976
Capricorne	Sen. Gam. Mau.	1980
Capricorne	Sen. Gam. Mau.	1980
Capricorne	Sen. Gam.	1982
Capricorne	GB. Sen. Mau. Gam.	1977
Capricorne	Sen. Gam. Mau	1981
Chalo	Gambia	1975
Thue Jr	Sen. Gam.	1970
Viandra	Gambia	1973-74
Dr. Fridtjof Nansen	Morocco to Ghana	1981
Laurent Amaro	Sen. Gam.	1983
Laurent Amaro	Sen. Gam.	1984
Astra	Gambia	1973

Source: Van Der Knaap, 1985

## 6. Committee for Eastern Central Atlantic Fisheries

The Committee for Eastern Central Atlantic Fisheries (CECAF) was created in 1967 by FAO. Like other regional fishery bodies in various parts of the world, its purpose is to promote cooperation among nations sharing a common fishery resource and occupying a common aquatic ecosystem. It operated effectively in promoting cooperation among west African coastal nations and European nations that fish on African stocks. A principal objective has been to assist member governments in establishing the scientific basis for regulatory conservation measures. Its area extends from the Straits of Gibraltar to the Congo River. Member states include not only African nations but several countries of Europe, the United States, and Cuba.

CECAF has been effective in standardizing and improving fishery statistics and biological data; developing systems for monitoring resources and evaluating fish stocks; strengthening the capacity of member nations in management of the fishery resources; training personnel for these functions; promoting, coordinating, and assisting in programs of research; promoting the development of aquaculture; and promoting the development of some individual country programs. This kind of cooperative effort is especially valuable for a country like The Gambia whose size and resources make it impossible to launch and sustain the activities necessary for proper development and protection of its fisheries.

UNDP provided the major funding for CECAF for most of its existence, with additional help for various special projects from other sources including Senegal, Spain, Canada, Norway, Denmark, France, Morocco, the U.S., and the FAO regular program.

At the end of 1984 UNDP terminated its support of CECAF, in accordance with its policy of passing the cost of projects to the nations that benefit. UNDP expressed the hope that the member countries would take over the financial support of CECAF; however, this was not done despite strong expressions of support for the programs. The annual budget at that time was about \$765,000, of which about \$150,000 supported the secretariat in Dakar.

AID/Washington, with the strong backing of its Office of Science and Technology/Agriculture, agreed to fund CECAF for two years. At the end of that period, in 1986, their funding stopped. The CECAF activities have therefore almost ceased; the secretariat has been moved from Dakar to Rome.

## 7. African Coastal Security Fund

This project, for "developing The Gambia's capacity to protect its fisheries resources," was funded by the U.S.

Department of Defense, 1986-88, at a level of \$350,000. Part of the money was to have been used to build a jetty for The Gambia marine unit. The rest was to have been spent for spare parts and other equipment for the fisheries patrol vessels. An extensive list of requirements was submitted in September 1987, but only \$18,000 worth of supplies has been delivered. The bottleneck appears to be at the Department of Defense in Washington, D.C. This has hampered the efforts of the marine unit to upgrade surveillance of foreign fishing in the EEZ, and to enforce the fishery laws of the GOTG.

#### 8. Fisheries Patrol Vessels

In 1987 the government of China supplied two vessels to be used by the Gambian marine unit for fisheries patrol purposes, and experts to assist in the training of the Gambians to operate them. These vessels are reported to be nearly ready to begin operation.

**CHAPTER V**

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**A REVIEW OF MARKETING DIVERSIFICATION PROJECTS**

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## CHAPTER V

### A REVIEW OF MARKETING DIVERSIFICATION PROJECTS

#### A. Introduction

##### 1. Definition of Agricultural Marketing

Marketing means buying and selling (trading). Thus, a fundamental role of the marketing sector is to discover the agricultural commodity prices that strike the balance between the ability and willingness of producers to sell and the needs, desires, and purchasing power of consumers. The function of marketing is to resolve the differences between these conflicting points of view and to approach an optimal solution, which would be allocating the goods available among buyers at prices at a level acceptable to both buyer and seller.

Farmers, however, think of marketing in terms of the difference between the retail price and the farm-level price. Marketing as understood by businessmen and industrialists does not include processing, which is considered manufacturing, transportation, or storage. These would be considered separate functions. The commercial concept of marketing includes advertising, selling, sales promotion, and market research activities as major marketing functions.

However, this report uses a more comprehensive definition of agricultural marketing, the one generally used and understood by agriculturists. This concept of output marketing looks at the subject from a farmer's perspective. The procurement and distribution of farm supplies and equipment is included and often called "input marketing." The following definition will be used:

Agricultural marketing includes all of the intermediate steps between the farmer and the ultimate consumer. The functions include local assembly, packing, sorting, transportation, storage, processing, wholesaling and retailing of food and fiber, and procurement and distribution of agricultural inputs.

##### 2. Other Marketing Concepts

There are other marketing concepts that are used in various contexts. They pertain to marketing functions, marketing services, and institutions. They relate to the roles of the various actors in a marketing system: farmers, marketing enterprises, consumers, the sector as a whole, and traders.

Any commercial business has a marketing function, including a farm business. Actually most farmers in The Gambia market some

of their produce even though the quantity they sell may be very small. Some Gambian farmers participate actively in marketing by selling produce directly to local retailers or to consumers. Each farmer, looking at marketing with a micro-perspective judges performance of the marketing system in terms of market access and prices received at the farm level.

From the macro-viewpoint, marketing is considered a sector to be addressed by government policies, regulations, services, and development strategies. The concern is with overall efficiency in distributing food and farm inputs; with adequacy of the food supply; with contributions of the agricultural sector to foreign exchange earnings; and with the fairness of the transactions between the enterprises in the sector and farmers and consumers.

### 3. Value-Added Projects Included

There have been few, if any, marketing projects in The Gambia addressed exclusively to agricultural diversification. However, in keeping with the broad definition, in addition to entirely new ventures, the team considered projects that add value to presently produced commodities by export or processing as diversification projects. Value-added enterprises can, if profitable, contribute greatly to diversification of output, and to increased income, employment, and exports.

### 4. Approach to the Review

The team reviewed the literature relating primarily to marketing and conducted interviews with knowledgeable people in The Gambia. They supplemented these activities by reviewing production project documents regarding marketing aspects and observed markets in operation at major trade centers in each of the divisions in the country. They also visited some smaller village markets. They were able to see the products being traded and the facilities and conditions for trading, to check prices, and to interview some of the farmers and traders.

Some of the commodity-specific aspects of marketing were presented in chapters II and III. This chapter will briefly discuss the historical evolution of marketing in The Gambia, and will present the findings of the team's marketing review according to the various GOTG and donor interventions designed to develop marketing institutions or to solve problems perceived as marketing problems.

## B. Marketing in The Gambia

### 1. Long History of Trade

The Gambia has been a trading place for many centuries. Judith Ann Carney points out in her historically oriented social analysis of rice production in The Gambia (Carney, 1986) that long-distance trade routes have existed in what are now the Sahelian countries since the ninth century. The early trade was between people from desert oasis and trade centers in the drier parts of the Sahel (for example, Oalata in Mauritania ) and the inhabitants of the wetter areas including Senegambia. Salt from mines in the Sahara was the major item exchanged for cereals (millet, rice, sorghum) from Senegambia.

Later, with the advent of the colonial period, Gambian trade expanded to European countries, including Portugal (which introduced groundnuts to the area), France, and the U.K. Trade has increased since independence, and Gambia traders now operate worldwide. Imports consisting of consumer and industrial goods come from many sources, e.g., China (tea, textiles, housewares); Japan (automobiles); the EEC (foodstuffs, household and industrial goods); Thailand (rice); the Middle East (food and household goods); Italy (fertilizer aid); and the U.S. (rice aid). Enterprises from the Scandanavian countries launched the tourist hotel industry and have since been active in developing fish processing and other enterprises.

Consequently, people who live in what now constitutes The Gambia have negotiated with overland traders from the Sahel and other parts of Africa, and overseas traders from the rest of the world for a long time.

### 2. Contemporary Trading

There are a very large number of private traders in the Banjul metropolitan area and in the up-country villages. Some larger traders conduct the import business. Gambian merchants currently conduct very active trading within the country and participate extensively in the re-export trade. Value added by re-exports has been estimated to account for about as much as 15 percent of the current Gambian GDP.

The Gambian Produce Marketing Board (GPMB) is the principal, but no longer the exclusive exporter of groundnuts and groundnut products to overseas markets. The elimination of the GPMB's monopoly role in the groundnut trade has resulted in a large decline in the Board's throughput (and a corresponding increase in the sales by Gambian farmers on the informal market, mainly to Senegalese buyers). In the last marketing season (1988-89), GPMB volume dropped to 25 thousand tons compared with 62 thousand tons the previous season.

The north-south highway and Soma-Farafenni ferry crossing establish the principal trading link between the Casamance and the rest of Senegal. The Sunday market at Farafenni is a major point of interaction of Gambians with traders from Senegal. The team observed the trade in livestock, cereals, and oilseeds and found the up-country markets to be very active even though the visit was made near the end of the dry season, several months after the peak of the post-harvest trading season. The informal markets function well in that exchange takes place and competition is intense, providing farmers and consumers with options. However, because of the low throughput for a typical trader, the trading activity is comparatively costly because it consumes much of their time. Moreover, some farmers were reported to travel considerable distances on foot or with donkey cart to attend the markets. There is very little refrigeration or freezing capacity to protect perishable foods at most of these markets.

The Gambian Cooperative Union (GCU), an apex organization and its constituent cooperative societies (reduced from 86 to 54 under the ERP) is a buyer of farm outputs and a distributor of fertilizer, farm implements, and seeds. The GCU has become the principal buying agent of the GPMB for the purchase of groundnuts from farmers. Review of the historical data indicates that the GCU has substantially increased its share of the portion of the groundnut trade flowing through the GPMB, as independent traders have withdrawn from the activity.

It was reported that the private traders withdrew because they were unable to compete with the GCU. GCU had superior buying power and its operating costs were subsidized and losses were ultimately assumed by the GOTG. The GCU was the mechanism for distribution of subsidies to farmers. The GCU is said to be in a weak financial condition and likely to fail. If it does, the marketing of farm products and the distribution of inputs would be seriously disrupted.

The main inputs distributed through the GCU are fertilizer and farm implements. Sales are facilitated by extension of annual production credit (mainly for fertilizer) and intermediate credit (5-year terms) for two-wheeled pneumatic-tired ox and donkey carts, and animal-drawn Sinehoe seeders, plows, and cultivators. Credit is extended to the primary cooperative societies and they, in turn, lend to farmers.

The majority of the machinery is imported from Senegal. There is an alternative source of implements for farmers with access to cash. The offerings in the village market include reconditioned, rebuilt, and new implements assembled by local blacksmiths or imported from Senegal. These were reported to be substantially less expensive than the new Sengalese models distributed through the cooperative network, but the quality was

said to vary. Farmers have been able to acquire implements for animal traction technology, reported to be available to about 70 percent of Gambian farmers.

The cooperative organizations have not been able to function well in serving the farmer with timely and appropriate inputs nor as business institutions. They have incurred substantial accumulated operating losses because of high overhead costs and poor credit recovery. They have not been able to deliver inputs or market the farmers' outputs effectively despite substantial external support. Funding and technical assistance for the cooperatives continues under ADP2 and donors. The number of cooperative societies has been reduced from 86 to 54 in an effort to reform the credit program and restructure the GCU so as to reduce the activity level.

Considerable resources have been used to develop the GPMB following its establishment in 1973. It was a successor to the Oilseeds Marketing Board set up in 1948 and by the enabling act it assumed responsibility for the purchasing, collecting, transporting, processing, and exporting of groundnuts. The Board also furnished groundnut seed and fertilizer to growers. Before ERP, the GPMB had exclusive rights and responsibilities for these marketing functions.

Because of poor performance and the impact of its operating losses on the overall financial problems of the GOTG, GCU has been in the process of restructuring since the advent of the ERP. The number of staff has been reduced, administrative procedures for granting credit have been tightened, and credit has been denied to societies with poor repayment records.

### 3. Fertilizer Distribution

Co-operative societies have dominated the internal distribution of fertilizer for the majority of Gambian farmers in recent years. Members of the team visited the headquarters of the GCU and four of the depots operated by the societies in the western division and the MID. The team observed the merchandise on hand in wholesale quantities at the central store in Kanafing and the stocks available at the depots. At the time of the visits, fertilizer and animal carts were the only items on hand for sale at the depots that were open.

The retailing of farm inputs is costly if kept open on a full-time basis throughout the year. The demand for farm inputs in The Gambia is highly seasonal and average throughput is quite low. The depots are simple warehouses. The depots could easily be operated by an adjacent or nearby trader, and kept open throughout business hours without employing a full-time clerk to handle farm inputs. The village general merchandisers in The Gambia handle very short lines of consumer goods including bagged

goods such as rice. They would have the time and ability to sell fertilizer as well. This would provide better service to farmers at lower retailing cost than the present system. However, some cooperative outlets, such as at Jahally-Pacharr are isolated from trading centers and could not be operated in this manner.

This year (1988/89) about 7.5 thousand tons of fertilizer was acquired for distribution in The Gambia. The fertilizer was paid for by a grant from the Italian government. Upon arrival at the port of Banjul, the fertilizer was transferred from the Italian ship bringing it directly to river barges of the GRT. The fertilizer was auctioned off by the GOTG. The GCU acquired about 5,000 tons and the Danish-supported MOA-FAO project bought 2,500 tons. (Subsequently, in May 1989, a second auction was held at which the price of fertilizers were reduced by a large amount.)

That quantity constituted one barge load and was all the project could afford at one time. The MOA-FAO share of the fertilizer was moved upriver on a backhaul (for groundnuts) after discussion with GPMB.

The barge moved upstream and delivered fertilizer to 10 wharves along The Gambia River and was then trucked to 33 private dealers and 50 agents of the maize growers association. The distribution was completed within four weeks from the end of January when the shipment arrived to the end of February.

The GCU has only distributed part of its supply so there will be some carryover despite the large reduction in price in May, not an unusual experience according to reports of the situation in the past.

Grain and oilseed producers have cash to buy fertilizer when they sell their crops in November/December. However, the fertilizer needed for the next rainy season is not readily available until May/June and by that time the farmers are short of cash.

The MOA-FOA project also organizes the distribution of other farm inputs, notably seed, pesticides, and implements.

MOA-FAO sales prices to farmers are lower than the GCU prices. According to FAO, the GCU price is slightly higher partly because its costs are higher. Truck transport cost is higher than barge rates and the GCU has a greater staff to sales ratio than the FAO/MOA project. GCU has 40 trucks compared to four used by MOA-FAO. Barge distribution costs 56.5 bututs per ton delivered to any of the delivery points on the river that were utilized during the 1989 delivery season. The price to farmers for fertilizer is the same throughout the country.

The MOA-FAO project reported no significant problems in collecting payments for fertilizer from its dealers.

C. Interventions Intended to Counteract Traders' Advantages

The private trade sector functioned well in The Gambia from the standpoint of effectively moving goods, including agricultural commodities, from the farm to domestic urban areas and export outlets. Their sector also distributed the basic necessities from the urban to the rural areas. This private system has continued until the present time as the primary means of marketing rice, tea, beverages, and other consumer and industrial goods, most of which are imported. It is also the principal means for exchanging locally produced items including staple foods and fresh produce. The system works well and despite limited facilities in most markets, a rather wide variety of goods can be purchased. Soft drinks and foods are available everywhere and such disparate items as fresh bread and cement, for example, can be purchased in village markets along the highway from Banjul to Basse. Privately operated supermarkets have sprung up in the urban areas.

However, there was reportedly tension between farmers and the trading community over agricultural commodity prices and loans that was seen as a problem. Farmers perceived that the traders had the upper hand in the transactions and were able to take an "unfair" advantage of them. The practice most mentioned in the literature was the speculative activity of traders. They apparently bought food from farmers at harvest time when farmers wanted cash and sold food on credit later when farmers needed food during the hungry season, keeping some farmers perpetually in debt.

After independence, the GOTG sought to tilt the balance toward farmers and consumers through official pricing of agricultural commodities for farmers, retail price ceilings for basic foods, development of infrastructure through direct investment in marketing enterprises (parastatals), and establishment of cooperative societies. The infrastructure investments and the cooperatives have been backed heavily by donors and development loans from international institutions in the past. Funding and technical assistance for the cooperatives continues under ADP2 and donors.

These strategies had unintended consequences. In the years before the ERP was adopted in 1985, income from groundnuts was diverted to other projects and to futile efforts to stabilize prices for Gambian growers in the face of declining market prices for groundnuts and groundnut products. Maintenance and modernization was neglected. The efficiency of established facilities deteriorated. Plants to process some commodities never reached economic levels of throughput (e.g., cotton gin,

citrus plant). Price relationships became distorted, sending misleading signals and tempting Gambians to engage in illegal trade in groundnuts and fertilizers with Senegal.

Because these strategies were not successful in accomplishing the intended purposes, the programs for implementing them have been dropped or substantially modified under the policy directions set by the ERP in 1985. Retail ceiling price regulations have been dropped. Government-owned enterprises have been reallocated to the private sector and will move over the next few years. Substantial progress has been made toward introducing competition in the marketing of outputs and inputs within the country. However, additional steps still need to be taken to achieve privatization of the export of groundnuts and the import of fertilizer at the national level. The domestic prices of fertilizer are still substantially below international price levels and it is not clear to what extent the GPMB-processing activities can operate profitably.

Senegalese traders can compete for the groundnut supply, but no visible sizable competitors in the overseas groundnut trade. There has been very limited participation by traders other than the GCU in fertilizer distribution. There are small-scale imports of fertilizer by private traders or by farmers for use in their own operations. But as yet there are no established trader or traders identified for the large-scale importing and selling wholesale of fertilizer. So, the GPMB is still the only major exporter of groundnuts overseas, the GCU is still the major distributor of fertilizer, and the GOTG, through the Ministry of Finance and Trade, is almost the only fertilizer importer. Whether in private or public hands, these near monopoly activities necessarily require administratively set prices. The prices can and should be established in line with international border prices at Banjul whether they are in private or public hands. The need to have positive "bottom line" would be a much stronger incentive for a private concern to make necessary adjustments than for the GOTG. A planned direction for reform in the groundnut trade has been set. However, there is no apparent plan in place to accomplish the needed adjustments in the fertilizer trade at the national wholesale level, i.e., large-volume importation.

#### D. Marketing of Fish

##### 1. Domestic Marketing

An inadequate marketing system has been cited as the greatest impediment to the expansion of the artisanal fishery in The Gambia. Among the weaknesses are poor overall quality, processing, and distribution. These are all intimately linked, and are caused by a combination of lack of information and experience on the part of the fishermen, hawkers and retailers;

shortage of ice; poor roads; and a hot climate. Unusually high perishability is a characteristic of fish. While red meats and some other foods improve with some aging, fish quality begins to deteriorate from the moment the fish is removed from the water.

Fish from the artisanal sector are sold fresh, smoked, dried, and frozen. Consumers prefer fresh fish; smoked fish is consumed mostly at greater distances from the fishing beaches; dried fish is less common. Frozen fish and shrimp is mostly for the hotel and export markets.

Another major constraint to the expansion of fish sales in The Gambia is the low buying power of the population.

Yet despite these difficulties, fish constitutes a highly significant part of the diet of the Gambian population. Some essential amino acids are scarce or unavailable from other foods consumed in the local diet.

## 2. The Artisanal Fishery

In the most active segment of the artisanal fishery, that on the Atlantic coast south of the river, the fishing canoes usually land their catch some time after mid day. The canoes anchor a few yards offshore and their catch is carried in baskets to shore, usually by women. At the boat or on shore, the catch is bought by hawkers. The hawkers often lend money to the fishermen in exchange for their catch, in effect establishing a guaranteed supply.

The hawkers carry the fish by bicycle, motorbike, or taxi to markets in the adjacent towns and villages. The fish is carried in baskets, usually in ice. The ice comes mostly from a plant in Brekama, built for this fishery by the artisanal fishery development project. There is not sufficient ice to satisfy the demand, and considerably less than is necessary to maintain the fish at a satisfactory state of freshness.

Fresh fish is therefore available to consumers only about 35 kilometers from the fishing beaches, and the quality declines rapidly with distance. Bonga, the local shad, is by far the most common species sold fresh to the local population (80 percent), partly because it is the cheapest variety. Marketing is made more difficult for this species since it exhibits marked seasonal and short-term variations in abundance: catches are much the greatest during the rainy season. The fresh markets becomes saturated so that a higher proportion of the fish must be smoked, returning a lower price than the fresh product.

The upper limit to the local market for bonga appears to be the ability of the populace to pay for it rather than saturated

demand. And the lack of good roads, particularly on the north bank, severely limits distribution.

The bonga that is not sold at the end of a day is smoked. And in times of high catches in the rainy season, the excess catch is smoked immediately--resulting in a better product. This is a hot smoking process, which removes approximately half the water from the fish. The shelf life is about three months.

Other species preserved by smoking include sharks and rays, the marine snail called yeet, and a number of demersal species.

It is estimated that 80 percent of the fresh bonga is consumed within 35 km of the beach and 70 percent of consumption farther away is of the smoked and dried product.

Smoked fish are also exported to nearby African countries. Smoked shark fins are exported to the Far East, especially Hong Kong.

A considerably smaller quantity of fish is sun dried, usually with the use of salt. The quality and demand for this product is low. The market is to inland areas of The Gambia and to some neighboring countries. Local firms are trying to develop markets in west African countries for low value fishery products. One attempt by National Partnership Enterprises to develop such a market in the Côte d'Ivoire did not succeed, partly due to currency exchange problems.

Fresh fish and some frozen fish are sold to local hotels, hospitals, and prisons through contractors. Hotels show a growing demand under the stimulus of the tourist trade.

Artisanal fishermen in the river use gillnets, and land their catch at a large number of villages. From here the fish is carried to nearby local markets and retailed by women, usually wives of the fishermen. There is little ice for packing fish to keep them fresh. Solefish and shrimp, portions of which are produced by the artisanal fishery, have first priority, and are frozen and exported to European markets. The remaining fish, those for local consumption, therefore have little ice and are often of lower quality. Inadequate transport is also a major constraint.

The report from the Ministry of Water Resources, Forestry, and Fisheries cited average fish prices at D.63 per kilo for fresh bonga and D.25 per kilo for smoking-quality bonga. Consumer prices on Gambia's coast were considerably higher. The highest consumer prices (fresh demersal fish and solefish being the most expensive) were found in Basse, 225 miles from the coast.

### 3. Industrial Fishery

The industrial fishery is conducted offshore, mostly by foreign vessels. And in most cases these vessels process their catch at sea and transport it to foreign markets.

An exception is the Seagull Fisheries operation, where pelagic fish, mostly sardinella, are caught by purse seine, landed in Banjul, and frozen in a plant there. This product is shipped to Ghana, and to a lesser extent to other west African markets.

Another exception is the marketing of shrimp. The shrimp produced last year by the ScanGambia farm were frozen and shipped to European markets. Shrimp caught by trawlers for National Partnership Enterprises and Lyefish, as well as most of the shrimp caught by artisanal canoes for these firms, is frozen in Banjul and shipped to European and other markets abroad. A small amount supplies the local trade, mostly to hotels.

As an incentive to increased export markets, the GOTG recently removed the export duty on fish products.

There is a growing demand for the higher priced demersal fish in the local market, and for export. The Gambia would benefit substantially if more of this class of fish caught in the industrial fishery were processed in this country. It would be possible to specify that a certain amount of the catch of foreign vessels has to be landed in Banjul, as a condition of the license. Clearly this could not be done under the present circumstances, since there are not adequate docking and cold store or freezer facilities locally. A study of this should be considered.

### E. Interventions to Overcome Demand Constraints

#### 1. Effective Domestic Food Demand Limited

The domestic market is small in The Gambia for perishable (e.g., vegetables, eggs, etc.), processed, and packaged foods. This limits the opportunities to engage in marketing enterprises that require large scaling to be feasible and reduces the liquidity in the market. The domestic market is small because the population is one of the smallest in Africa. The degree of urbanization is low and consumer income is low.

The relatively open borders with Senegal provide opportunities for trade. They make it impractical to effectively subsidize local enterprise by prohibitively high import duties or quotas. Access of Gambian importers to food supplies, particularly low priced commodities from Europe, provides stiff competition for Gambian producers of similar products.

Because personal income per capita is low in The Gambia private consumption expenditures in 1987/99 were only about 1,300 dalasis annually (the equivalent to less than 200 U.S. dollars). Consequently, the effective demand for foods is severely limited. Effective demand for farm inputs is also limited. Successful private traders have analyzed the market demand for consumer goods and adjusted their business activities to the realities of the Gambian marketplace.

Nationwide production programs have attempted to relieve the constraint on the purchase of farm inputs through subsidies reflected in prices charged the farmer, especially prices for fertilizer. Area-based projects, including those operated by NGOs, have brought inputs, farm implements, and post harvest equipment such as cereal mills to Gambian farmers. In some cases eligibility for inputs at favorable prices has been tied to food distribution programs (e.g. CRS nurseries). NGOs have also been active in promoting and distributing seeds.

Early diagnoses of constraints to farm production identified lack of inputs as a major constraint and saw production credit as the means of enabling farmers to acquire the inputs. There was a credit component in the major projects in The Gambia. The payback record has been poor for several reasons. One of them is that loans to mainly subsistence farmers are really consumer rather than production loans, when the residents of a compound consume the increased production generated by the inputs provided by credit.

## 2. Tourist Hotel and Restaurant Markets

The tourist industry food services say they purchase as many locally produced agricultural products as possible depending upon availability. They buy virtually all fish and eggs. They say that they try to buy most fresh fruits and vegetables on the local market except those such as potatoes, which are regularly imported from Europe. They buy Gambian beef in whole carcass or quarter form for all their needs except special cuts such as filets and other steaks. This was estimated by food service managers as being 10 to 15 percent of the usage in the more expensive tourist hotels. They also import lamb and pork products and packaged foods of all kinds.

An industry of "food purveyors" exists to supply the hotel and restaurant market with local produce. It consists of small-scale individual private sector middlepersons who take orders from the food service managers of hotels and restaurants catering to the tourist trade. Many of them are women. These middlepersons act as buffers between the hotel and the farmers. According to managers at three major hotels interviewed by the team, this system of small purveyors works well to bridge the gap

between the hotel and restaurant buyers and their many local suppliers. The buyers want to place orders, often a day or two in advance, and want to deal with and take delivery from a manageable number of suppliers.

In the case of fish, the hotels buy directly from a limited number of fishermen. They buy when fish are available and keep them frozen until needed. Most local beef for the tourist market originates with the LMB abattoir, but is purchased from individual butchers rather than directly from the LMB. At the time of the team visit, eggs were purchased locally, generally from one or two selected farmers who are considered to deliver the best quality eggs. The managers interviewed referred to problems with dumped eggs from Europe in the local market. Local broilers drew mixed reviews. Clearly there have been problems with spoilage due to improper freezing with the result that some managers say there are still problems and others say the quality is fine (from the same suppliers).

Since tourist demand and local supply for some local produce vary seasonally, especially fruits and vegetables, it is not surprising that buyers point out the lack of sufficient supplies during the peak tourist season and that some local suppliers complain that when the tourists are present in large numbers, their produce grades are acceptable and during the slack time of the off-season during the summer, more produce is rejected.

Some items, such as fresh mangoes, are available only seasonally; but, the tourist industry buyers would like supplies of basic items that conceivably could be produced continually, such as lettuce and tomatoes, to be available locally year round.

The tourist market is limited compared to export potential but substantial in relation to effective domestic demand. Fresh horticultural produce is one of the main products sourced from local suppliers. Very rough estimates based on outdated survey reports suggest that the total consumption of vegetables by the resident population (not effective market demand) may be near 15,000 tons annually and that the effective demand in the tourist market may be as much as one-third of total consumption or nearly equal to effective market demand. Tomatoes and onions comprise slightly more than one half of the demand according to the surveys. Fresh fruit demand was indicated to be about 11 to 12 percent of vegetable demand. The number of tourist visitors has increased by a multiple of five since 1980 and The Gambia's production capacity has increased. A current and more comprehensive survey providing more accurate data would be extremely helpful for the diversification effort. Those most concerned, perhaps the personnel from the largest restaurants and the largest restaurant suppliers should be included in the survey.

### 3. Export Markets

From 1973, when the present marketing board (the GPMB) was established, to 1985 when ERP began, the entire groundnut export and processing activities and new value added or export oriented enterprises (citrus, hides and skins, cotton) were taken over by GPMB, or other parastatals, or defacto parastatals such as GCU.

Since 1985, new private or partly private enterprises have been established without direct interventions similar to those of the past. Horticultural exporters, for example, have been set up with established access to foreign markets and without subsidies except those generally available under the GOTG investment incentives program. The volume is sufficient to justify chartering large jets to export the perishable horticultural crops targeted to niche markets in the United Kingdom. The potential markets abroad for selected fruits, vegetables, or flowers is very large compared to The Gambia's potential production capacity. However, there is substantial existing and potential competition from producers in the Carribean, South America, Mexico and Central America, east Africa or other countries in west Africa. The main factor in supplying these demands is the ability of Gambian producers to compete.

While the large-scale horticultural crop producers set up to sell some produce to tourist industry establishments, they say they prefer the overseas market because of the breadth and depth of its demand and its liquidity (assured sale and prompt payment). Based on the team's observations and discussions with tourist enterprise managements and tourist industry suppliers, it was concluded that the existing system (of small purveyors handling the output of small producers and direct sales by larger farmers) functions well to bridge the gap between the hotel and restaurant buyers and their Gambian suppliers.

The most promising model for developing production in The Gambia for the tourist and export markets is suggested by the successful enterprises in the horticultural crops sector. The model could also apply to large-scale commercial production of other crops.

#### F. Thin Markets and the Glut Problem

There are "thin" markets for some foods for which production can be readily increased rapidly in The Gambia. Therefore, producers can be exposed to severe disappointments (spoilage and poor prices) when production of fresh produce increases enough to flood the market all at once, the "glut problem". Gambian producers have experienced this problem with onions, tomatoes, eggs, and broilers. These experiences discourage producers and are particularly counterproductive when they are the consequence

of officially promoted campaigns. No direct attempt has been made to impose "supply management" for fresh produce in The Gambia. This would be totally impractical even if it were considered desirable. The GOTG recently increased the duty on poultry products. This would have the effect of slowing imports of inexpensive (allegedly dumped) shipments of eggs and broilers from Europe and raising prices received by local producers.

The glut problem was identified by an MOA task force representing all interested departments as one of two major problems for Gambian horticultural crop growers. (The other was transport which will be discussed in the next section.) The DAR with GARD participation conducted a study of the problem, and concluded that the appropriate intervention would be to disseminate information concerning the timing of demand in the market and suitable varieties and cultural practices as a means of promoting staggered planting.

#### G. Efforts to Solve Transport Problems

##### 1. Transport Problems and Solutions

The second major marketing problem for farmers according to the MOA survey is unavailability and high cost of transport. Transportation still is a problem at all levels of marketing: field to village, village to trade center, up-country divisions to Banjul, and export. Both sea containers and air space are limited. Over the road vehicles are limited in number and many are in poor condition. Though roads have improved, many are rough and sometimes impassable.

Solutions are straightforward, but not inexpensive and not easy to fit with the scale of farming in The Gambia. The typical solutions in past development projects have been for donors to provide vehicles and sometimes storage or processing facilities. However, this action sometimes neglected the fundamental question of whether the vehicles were economically feasible. Transport cost is very sensitive to full utilization of the equipment and service depends on adequate maintenance and repair. This means that there must be an adequate supply, a "critical mass", in a village or locality to justify organizing transport and the spare parts supply and mechanical service must be maintained. The team found evidence of equipment neglect and failure to provide for replacements and even cases where donated equipment had never been used.

Communications facilities that would enable more efficient marketing are also limited within the country but internationally they are not a constraint. In fact, worldwide telex, fax, and phone links exist and work well.

Storage facilities or processing have been advocated and studied as a means for easing transport difficulties.

## 2. Village Storage Structures

According to a report by Langan (Langan, 1987), the GOTG, with donor assistance and the help of farmers, constructed 573 village seed storage structures. The involvement of the farmers was a positive aspect, but the MOA unit responsible for maintenance was not able to maintain the structures. The result was that farmers preferred to store seeds in their homes. Farmers interviewed by the team confirmed that they stored groundnuts and cereals for consumption, sale, and seed in their homes and this practice was also reported in other literature on Gambian produce marketing.

## 3. Cold Storage

There are private firms engaged in providing for-hire cold storage for perishable foods. The fisheries industry establishments and other firms processing or exporting perishable commodities are equipped with their own cold storage. Major hotels and restaurants, supermarkets, some individuals' property, and the largest producers of broilers have some freezer capacity as well as reefer space. However, there is no cold storage incorporated in the port facilities available to support a greater volume of trade in perishable items. Perishable produce, including eggs, meat, and horticultural commodities were observed being sold throughout the country without any refrigeration. The overall access to refrigerated and freezer storage appears grossly inadequate in regard to both volume and capacity to handle commercial quantities of food, which arrive at one time (e.g., household chest freezers packed full with unfrozen broilers). Despite the apparent need for cold storage, the team was informed that a cold storage facility erected with Japanese support for fish products remains unused.

The universal need for backup power generators adds to the operating costs for storage of cold or frozen foods. Frequent power outages threaten both the safety of the food for human consumption and the life of the storage equipment. Spoilage of food because of interruption of power for an extended period has caused serious illness in some cases.

GARD studies exploring the possibility of storage for horticultural products as a solution to the market timing problem, concluded that cold storage was not economically feasible for that purpose.

Food marketers in The Gambia will continue to face relatively high transport, overhead, and retail costs because of the small quantities involved. The climate imposes technical and

economic problems for food storage and is hard on buildings and equipment.

Processing facilities have been established for groundnuts, citrus products, fish, meat, cotton, hides, and skins, which according to the reviewed reports have not been very successful but are still functioning. Restructuring may enable some to be self-sustaining and profitable.

The problems persist, but are not insurmountable. The private sector will provide transportation, storage, and processing services, but only when economically feasible. Processing to permit storage and delayed shipment has worked in African countries and has potential in The Gambia. However, market access, adequate capital, and competent management is essential. This means that private investors in commercial agriculture in The Gambia must carefully evaluate the effects of transportation costs and opportunities for storage and processing before undertaking a production project. Solving the transport problems from the areas of the country away from the airport by storage or processing may be a more viable option than trying to collect fresh produce for export. Production scheduling, a sufficiently large scale of production, and storage facilities are intrinsic parts of a fruit or vegetable processing operation.

#### H. Projects to Stabilize Commodity Prices

There is generally a demonstrated need in agricultural communities for relief from the often sharp fluctuations in market prices for cash crops. The prices often drop sharply in commercial markets, especially in international markets. The main food importing countries typically have relatively inelastic demands for most foods, so prices are very sensitive to small changes in supply.

There is a parallel urge for price stability in consumer circles if the cost of purchased foods is about to rise sharply when domestic supplies are short because of crop failures. Moreover, in the past, development economists argued that stability of price is an important dimension of "incentive" prices that would motivate farmers to increase their output for the market. The classic intervention designed to achieve stabilization is for the government, directly or through a marketing board, to stabilize farm-level prices through regulations or fixed prices and to stabilize consumer prices by wholesale and retail price controls. Farmers and planners in The Gambia were no exception to "the urge to stabilize." So price stabilization measures were tried and they failed. The most significant case has been the attempts to stabilize groundnut prices to Gambian farmers.

The experience of the GPMB with price stabilization has been analyzed in detail in other recent studies relating directly to the ERP. The GPMB is not able to accumulate sufficient reserves to "stabilize" one set of prices in the face of declining world market prices and at the same time invest in other development projects.

Prices in internationally traded commodities such as oilseeds, oils, meals cereals, and fertilizers vary beyond the control of any nation. Privatization will make the market more responsive to changing conditions. Processing operations will become profitable or close down. However, price variation will continue to be a fact of life for Gambian farmers.

#### I. Physical Infrastructure for Marketing

A well functioning marketing system requires substantial investments in physical infrastructure, i.e., the facilities to enable the flow of goods from farm to market and from market to farm. In The Gambia, improvements in the quality of farm-to-market roads, additional piers and bulk materials handling equipment at the port, additional cold storage and freezer capacity at the airport and the seaport, more dependable electrical service, and better facilities for cleaning, sorting, packing and storing at the village markets would facilitate market development.

The GOTG, with donor support or loans from international institutions, has made some progress constructing physical infrastructures to facilitate marketing of agricultural products.

The paving of the main east-west highway has improved access to the port at Banjul so that much of the former river traffic (except groundnut exports) has been transferred from the river to the road. Local farm-to-market roads are generally rough and some are subject to flooding during the rainy season. The road system does not prevent marketing, but slows movement and adds to vehicle-operating costs.

The telephone system functions relatively well internally but the number of market participants with phones is very limited. Since telephone, telex, and fax are available for international traders, access to communications is not a constraint for those engaged in international trade. However, electric service is limited or nonexistent in many villages and frequently is overloaded or interrupted, even in the principal urban areas. This increases operating costs (for example, main or standby diesel-powered generators are required). Coupled with sometimes inadequate refrigeration or freezing capacity, this can cause fresh or frozen produce to spoil. According to responses in our interviews, this has happened in the case of frozen

broilers, damaging the reputation of the local product and threatening the public with serious illness.

While adequate infrastructures are necessary for efficient marketing, there is little being done. Viable opportunities for trade or processing and management and technical skills are needed to make the enterprises succeed. The general lack of adequate numbers of trained managers, scientists, and technicians hinders the expansion and improvement of marketing institutions and enterprises in both the public and the private sectors. This will be discussed further in chapter VI.

CHAPTER VI

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RESEARCH, EDUCATION, AND EXTENSION  
FOR THE DIVERSIFICATION EFFORT

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## CHAPTER VI

### RESEARCH, EDUCATION, AND EXTENSION FOR THE DIVERSIFICATION EFFORT

#### A. Introduction

Progress in agricultural diversification will require an effective agricultural research system, an effective education program to provide the necessary personnel, and a dynamic extension service to reach farmers. This chapter lists some of the major constraints and suggests approaches to address these constraints.

It is not intended that this chapter will include all the problems or all of the possible solutions. Such a detailed analysis would require much more time than this team had. The purpose of this chapter is to state the situation as it now appears to this consultant team in the areas of research, teaching, and extension.

#### B. Shortage of Professionally Trained People

The Gambia is critically short of qualified people to do agricultural and fisheries research, planning, statistics gathering and analysis, and extension work. Many government posts are unfilled and other posts are filled with persons who lack the education to perform effectively.

However, the agriculture and fishery sectors are not alone in their shortage of trained and effective personnel. Other government departments have similar shortages. The private sector also states that lack of effectively trained employees is a major constraint. Low productivity is reported to be a problem among laborers, middle-level supervisors, and senior employees.

The adult literacy rate is about 25 percent. Since independence (1965), the GOTG has increased budget support for education resulting in primary school enrollment rising from under 20 percent in the mid-1960s to about 51 percent today.

The GOTG has set a goal of 75 percent enrollment for both sexes in primary school by the year 2000. In support of that goal, the World Bank is expected to provide an IDA loan of about \$20 million for primary education. However, lack of qualified and motivated teachers plus a shortage of school books and supplies greatly reduces the quality of education that primary school children receive. Many school days are lost because of teacher absences for administrative duties and other reasons.

Secondary schools are also reporting similar problems to those in the primary schools. Among adolescents, a total of only 14.4 percent of the total age group attend secondary school. Post secondary school enrollment is even lower, with only 0.5 percent of the total age group enrolled.

Until The Gambia greatly improves the school system this problem will continue to be a major constraint to locating persons capable of learning the technology necessary for a modern, diversified agriculture.

The table below presents the number of secondary school graduates during the past three years, and the percentage of these graduates who appear to be qualified for further academic training.

Table 20. Gambian Secondary School Students who took the GCE "O" Levels During 1986, 1987, and 1988

	<u>1986</u>	<u>1987</u>	<u>1988</u>
Candidates Taking Exam	757	796	901
Passed in Division 3 and Above	355	339	450

Students who achieve Division 3 and above are more likely to be considered for further education at the university level. This is not a large pool of young people from which to draw.

Assessing the total needs of The Gambia for people with a scientific education is far beyond the mandate of this study in agricultural diversification. Improved communications (roads, telephones, bridges, etc.) and infrastructures such as reliable electric power impact on agricultural development. All of these elements require engineers and personnel trained in science.

The Gambia needs to make advanced education available to Gambian youth if true and sustained economic development is to be achieved. The first step might be a college of science that emphasizes a select number of subjects such as mathematics, chemistry, biology, zoology, statistics, economics, accounting, and English.

It is the understanding of this consultant team that a study of the possible expansion and development of The Gambian College will soon be undertaken.

### C. Trained Personnel in Agriculture and Fisheries Required

The Department of Planning, Agricultural Research, Agricultural Services, and Livestock Services in the Ministry of Agriculture, need more trained personnel to address the agricultural diversification effort. The Department of Fisheries, in the Ministry of Water Resources and Forestry and Fisheries, will also need to be strengthened in a like manner.

#### 1. Statistics and Economic Roles

Compiling agricultural statistics, completing economic analysis, assessing policy options and providing advice and guidance for a free and expanding economy are critical jobs. These tasks are being completed in the Ministry of Agriculture, The Ministry of Water Resources, Forestry and Fisheries, and the Ministry of Finance.

The statisticians and economists of the GOTG should play an important role in the planning of effective development efforts. The senior staff should be brought to the M.S. and Ph.D. levels. This would contribute to the coordination of the numerous donors and non-government organizations, which is a key task.

#### 2. Adaptive Research

Gambia's limited resources mean that it is not able to do basic agricultural and fisheries research. Gambia must borrow and adopt research findings from the international research centers such as the International Institute of Tropical Agriculture and the International Trypanosomiasis Center (located in The Gambia) and from neighboring countries (Senegal). However, the Department of Agricultural Research and other departments need highly trained scientists to interface with foreign researchers. Livestock and fishery scientists are required to borrow relevant technology for The Gambia's use from international sources, conduct adaptive research, and deal with the regional research institutes. The majority of research staff members should be trained to the M.S. and Ph.D. level.

#### 3. Promotion of Technology

The promotion of improved technology among farmers and fishermen/fish processors is a key step in the diversification effort. The Department of Agricultural Services, the Department of Livestock Services, and the Department of Fisheries, require trained staff to receive technology flowing from the research institutes and to communicate that technology to the farmers. Senior extension staff should be trained to the B.S. and M.S. level.

D. Review of Training Programs

1. Gambian Government Programs

It has been difficult to secure detailed information on the Gambian government scholarships, but it appears that the Gambian government is not sponsoring any students for the study of agricultural sciences outside the country. It was also reported that GOTG's recent shortage of funds has resulted in reduced scholarship funding.

2. USAID Programs

The United States land-grant university system offers outstanding training in almost all the agricultural sciences. It is generally felt that the U.S. has a comparative advantage in offering training in agriculture at the B.S., M.S., and the Ph.D. levels.

Because completing degree programs in the U.S. is time-consuming and costly, it is appropriate to review and determine how effectively the participants in USAID programs are being used by the Gambian government.

a. Soil and Water Management Project (1979-1990)

This project placed considerable emphasis on both formal and on-the-job training.

Eight participants were sent to the U.S. for B.S. degrees and one participant to the U.S. for an M.S. degree. The first participant left for training in 1981 and all participants had returned by mid-1988.

In addition to the U.S. training, the project provided ten Soil and Water Management Unit employees with a two-year diploma training course.

Seven employees have attended short courses or participated in workshops in the U.S. or other African countries.

Of the 19 long-term participants (diploma, bachelor, and master programs) 15 remain in the service of the Soil and Water Management Unit. The employee who earned an M.S. degree has retired from government service. Another employee left the unit to work for a non-government organization in the agriculture field and two others are employed in other departments of the MOA.

All of the above returned long-term participants have received on-the-job training from the technical assistance team.

However, eight additional B.S. degree candidates have been sent to the U.S. in 1988 and are still working on their degrees.

b. Mixed Farming and Resource Management Project (1981-1986)

One of the major mixed farming project goals was to develop and/or train qualified Gambian scientists and technicians to up-grade the educational level of department personnel within the Ministry of Agriculture and to prepare Gambian counterparts to carry out project activities.

The project sent nine participants to the U.S. to study for B.S. degrees and two to study for M.S. degrees. Three Gambians were sent to Nigeria on a certificate training program.

Of these 14 long-term participants, 10 remain with the Gambian government in extension, teaching, or research roles. Two are with a non-government agency doing agricultural extension work and one is with the Regional International Research Center outside The Gambia.

c. Gambian Agricultural Research and Diversification Project (1986-present)

The Gambian agricultural research and diversification project, like most U.S. technical assistance efforts, has also placed a major emphasis on training.

Fourteen Gambians have been sent to the U.S. to study for agricultural degrees. Of these, six are on M.S. degree programs and eight are on B.S. degree programs. Since these degree programs started in 1986, only two have returned from the U.S. with their degrees. They are engaged in research in the Department of Agricultural Research.

The three above projects sent a total of 35 Gambians to the U.S. or to other countries on long-term training programs. Of these 35 returned participants, 29 are still in the service of the Gambian government. Three are with NGOs doing agricultural extension work. Therefore, 91 percent of the returned participants are being used in government jobs or similar NGO jobs for which they were trained by USAID funds.

3. Other Donor Programs

The EEC and U.K. aid programs place much less emphasis on training than does American aid efforts. Although at least six Gambians are presently studying in the U.K. and the EEC countries, it appears unlikely that a major effort for additional training will be undertaken by these donors.

E. Professionally Trained Personnel Required for Agricultural Diversification

The Ministries of Agriculture and of Water Resources, and Forestry and Fisheries are the two government ministries in lead positions to encourage diversification of the agriculture sector. Therefore, the study team has completed a limited review of the required personnel for such an effort.

1. Ministry of Agriculture

The training needs of four departments: Planning, Agriculture Services, Livestock Services, and Research are reviewed. The GOTG has lost employees in recent years to NGOs, international organizations, and the private sector. This problem appears to be the most serious in the DOP; however, all departments have lost qualified employees. A considerable number of vacancies occurred in all of the departments studied. The department heads reported that they are free to fill these positions. It is recommended that these positions be filled over a period of time to assist in the diversification effort.

It was reported that few vacancies existed among the lower-level positions. These are the positions that might be filled by recent high school graduates who, after two years of work experience and additional education at the Gambia College, might be sent abroad for two years to work towards a B.S. degree. It is recommended that as vacancies occur, managers fill these positions with bright high school graduates who have the potential for more scientific education and who could in the future fill the more senior posts.

It should be noted that the large amount of training suggested in this report is a long-term objective that may very well take 10 to 15 years to achieve. However, a start should be made immediately.

a. Department of Agricultural Research

There are 43 established senior posts in the Department of Research, of which 20 positions are vacant as of June 1989. However, at this time the Research Department has seven employees on USAID programs in the U.S., one employee abroad on an FAO Program, and one employee away on an EEC program.

Considerable long-term training needs to be accomplished over a period of 10 to 12 years. It is suggested that a plan be developed to provide education to upgrade all researchers to an M.S. level. The program leaders, the director, and the deputy director should eventually hold Ph.D. degrees. It is suggested

that the following requirements be established in the Department of Agricultural Research and other departments for long-term training:

- o All employees must have at least two years of experience in their department before being considered for long-term training.
- o Upon completion of long-term training (B.S. or M.S.), the employee must perform his role in the department and receive on-the-job (OJT) training before being considered for additional training.
- o Senior and experienced research specialists will provide OJT.
- o A Gambian participating in a long-term training program must have at least 10 years of government service remaining before they reach retirement age.

b. Department of Agriculture Service

It was reported that the Department of Agriculture Service (DAS) has four employees with M.S. degrees and eight employees with B.S. degrees from a total of 26 senior-grade positions (grades 14 through 18). Fourteen employees should be upgraded in their education or replaced with personnel holding B.S. degrees at this time.

It is proposed that DAS positions be filled with six M.S.-level employees and 20 B.S.-level employees; therefore considerable training should be accomplished in DAS over a period of ten years. Plans should be developed to accomplish this task.

c. Department of Livestock Services

It was reported that the Department of Livestock Services (DLS) has 24 senior positions (government grades 14 through 18). Of these senior employees, six hold M.S. degrees or D.V.M. degrees and one holds a B.S. degree. It is recommended that 18 additional employees be trained to the B.S. level. The advanced degree holders are researchers who divide their time between research and extension. The director of DLS feels that most of the B.S. degree training in livestock should be completed in Africa and the team concurs with this suggestion.

Currently, four participants are studying for B.S. degrees, one is studying for an M.S. degree, and one is studying for a Ph.D.

d. Department of Planning

The Department of Planning has 13 positions at government grade levels 13 through 18. It was reported that of these employees three hold M.S. degrees and two hold B.S. degrees. At this time, two employees are on USAID-sponsored B.S. study programs in the U.S.

It is recommended that two employees be trained to the Ph.D. level, five employees to the B.S. level, and four employees to the M.S. level. A long-term plan (10 years) should be developed to provide the B.S., M.S., and Ph.D. levels of training to include all personnel.

e. Ministry Of Water Resources, Forestry and Fisheries

The Department of Fisheries has 13 posts with the grades of 14 through 18. It was reported that of these employees, three hold M.S. degrees and four hold B.S. degrees.

It is recommended that five employees be trained to the M.S. level and eight be trained to the B.S. level. A long-term plan using Gambia College science graduates should be developed to provide for the necessary training to B.S. and M.S. levels.

f. Training in Fisheries

The orderly and expeditious development of the fisheries in The Gambia requires extensive training of personnel at several levels. These levels include people who would be engaged in complex and difficult aspects of fishery science, such as population dynamics, and racial or genetic studies. At another level, trained people are needed at various technical and scientific disciplines involving fishery biology (reproduction, growth, migration, and diseases of fish). In support of these scientists, there needs to be a cadre of scientific technicians in such fields as biology, bacteriology, chemistry, physics, and mathematics trained in the careful collection and presentation of data series.

Because the Gambians lack a strong tradition of science and technology, it has been more difficult to fill many of the posts in government and industry.

It would be easy to list all the people who should be trained for service in the Gambian fisheries, but two circumstances make construction of such a list inappropriate. One is the lack of money, from whatever source, to finance a substantial amount of training that would be required and the other is the shortage of available qualified people for the training. The lack of a strong tradition in science and technology and in

recognizing the necessity of education for advancement in any field of endeavor has led not only to a shortage of qualified workers in science and science administration, but is handicapping the activities of commercial enterprises in the fisheries and aquaculture fields.

It is possible to suggest what can be regarded as minimum requirements. There needs to be one or two scientists or senior technicians trained in the biology and mathematics of population estimation and dynamics. At first these people would not perform the most difficult and involved kinds of calculations, but they should be able to supervise and collect the essential field data; organize it for analysis; and understand the results of the analysis in order to give advice on the translation of these data into management strategies.

A second kind of training is for three to five technicians to supervise and make field observations on catches of the more important species of fish and shrimp: sex ratios, length frequencies, species composition, and the other parameters that are indicators of the status of the stocks.

Finally, in the short list of essentials for training, one or two people should be instructed in basic food technology, in order to help the artisanal and other fishermen and distributors improve the quality of their product, which at present is below the standard necessary for good health, and to help meet the demands of many markets.

It should be added at this point that it will probably be difficult to find qualified people to enroll even in this small list of training activities. The numbers of students from the secondary schools who have competence in science and mathematics is small. One of the most valuable kinds of assistance that donors could give The Gambia would be help to strengthen their secondary educational system (and therefore, of necessity, their primary education system).

#### g. Training of Field-Level Staff

All of the above academic training has been directed to senior-level staff in the various departments. A knowledgeable and well-educated senior staff is the key to a successful in-service training program with the junior staff, whose objective is to work with 45,000 dabadas and the many fishermen in The Gambia.

This can be accomplished through five or six training/supervision sessions per year. Senior staff should serve as the instructors and should prepare simple "how to" bulletins for field staff, farmers, fishermen, and fish processors.

A structured train-the-trainer program should be initiated to prepare the senior national and division staff for the in-service training program. The field-staff training sessions should be of two- or three-day duration and on the specific farming operation underway e.g., planting or storage of grains, or the use of ice and other preservatives for fish. Research staff should contribute to the bulletins and simple line drawings used to illustrate the specific practices being studied.

Goals should be set in cooperation with the field agents and follow-up visits made to the districts to observe on-farm trials and other extension activities of the cooperating farmers.

The newsletter "Senelaa," The Gambian field workers' magazine, is a useful publication. It is very helpful in disseminating information to field agents and in promoting field extension work. It should be published about four times per year and distributed to all field agents of DAS, DLS, DAR, and to the NGOs. The "Extension Aids" section should be strengthened to allow it to publish more training materials and farmer bulletins.

F. Review of Agricultural Research Programs Since Independence (1965)

Faced with severe shortages of staff, limited budgets, and donors who often change emphasis, the Gambian agricultural research efforts have had limited success.

The Gambian research establishment is lacking staff educated to an M.S. or Ph.D. level, which would enable them to communicate effectively with scientists from the regional international agricultural research centers (IITA) and other regional centers. Contact has also been limited with Gambia's neighbors in the research field. Gambian officials should maintain contacts with research staff in other African countries.

USAID's mixed farming project (1981-1986) placed emphasis on livestock, forage, and maize production. The present USAID/ GARD project (1986-present), is placing emphasis on agriculture, economics, horticulture, and livestock. Although the project paper called for a follow-up on the successes of the mixed farming project, the GARD project did not accomplish this task. According to the development associates evaluation (January 1989), the GARD project attempted to implement the farming system research and extension (FSR/E) approach, but it was not well structured and generally unsatisfactory. The development associates evaluation also reported that a different approach of incorporating FSR/E procedures into technology development process is now being used. It also appears that USAID/Banjul in 1986/87 did not do the appropriate monitoring and supervision to ensure effective linkage between the two projects. It is now evident that USAID/Banjul has strengthened its monitoring and

supervision functions and that the Department of Agricultural Research and the GARD project are improving their contacts with the extension service (DAS) and the NGOs. A series of meetings and field days held between May and July 1989 for the DAS staff and the NGOs is evidence of this effort.

USAID's contract bidding system may not be adapted to the development of long-term development efforts. This system also tends to create excessive competition among sister institutions that, in turn, contribute little to the development effort.

The Overseas Development Authority (British aid) has made a considerable input in economies and seed technology over the years.

Research is a long-term effort (10-15 years for a given crop) and donors often think in terms of five-year projects. This causes problems and frustrations for the donors and the host country government officials.

G. Agricultural Research Priorities Should be Set and Efforts Concentrated

The analysis of agricultural research priorities by the DAR and the GARD advisors in The Gambia has been reviewed. It is an excellent application of the scientific methodology to set research priorities. The consultant team believes that this analysis was done in a logical way and, in general, concurs with the "high" research priorities; namely, groundnuts, cattle, early millet, swamp rice, fruit, small ruminants, and vegetables. It is also understood that cotton has now been added to the original list of "high" research priorities. Fish is an important part of the diet of the average Gambian, supplying more than half of the animal protein. It is also important to select areas where it appears there is the greatest opportunity for improvement of productivity. The team suggests that the highest priority research areas be as follows without ranking among them:

- o Groundnuts
- o Early millet
- o Upland rice
- o Maize
- o Fruits and vegetables
- o Fisheries
- o Small ruminants
- o Cattle

It is our opinion that emphasis on maize, fruits and vegetables, and fisheries and livestock research, enhance the diversification effort.

The technical assistance (TA) researcher should be a "hands-on" person and the TA must serve as the senior researcher in a given area for at least six to eight years. The TA researcher has a major role to play in OJT training, as the less experienced Gambian counterpart needs to work with an experienced senior TA researcher for several years.

The attraction of on-farm varieties testing has caused some observers to suggest that the Gambian Departments of Agricultural Research and Agricultural Services use the varieties developed by the IITA and others directly on the farm, since on-station research is expensive and time consuming. It has also been suggested that The Gambia cannot afford breeding programs to develop new varieties of crops specifically adapted to the environmental conditions of the country. It is suggested that the international research centers are better equipped and staffed to do the breeding, and that small countries such as The Gambia can take these varieties directly to the farmer for promotion. It is true that the international centers are in a better position to do plant breeding than countries such as The Gambia. However, it does not necessarily follow that varieties developed at the centers will be well adapted and possess the characteristics demanded in The Gambia. To assume so, necessitates the further assumption that there is no genotype by environment interaction. The objectives of the international centers are usually to select for low genotype by environment interaction, which means the varieties they develop should be relatively stable in yield over a range of environments. They will not necessarily be the highest yielding or best adapted at specific locations where photoperiod, soil conditions, rainfall amount and distribution, cultural practices, etc., differ from that where the variety was bred, selected, and evaluated. It is common, in fact, to provide genetically variable populations to developing countries with the understanding that research personnel in those countries select plants within the populations that perform best and have the quality characteristics desired by the people of that country. This is an option for The Gambia, which would allow for choosing the best-adapted genotypes, but avoid the effort and expense associated with a breeding program. To help ensure that the populations contain lines with potential for the country, it would be desirable for the breeding programs of the international centers to include germplasm of successful and widely grown varieties of The Gambia.

It should also be stressed that it would be unusual for all varieties of a crop developed at an international center to be adapted in The Gambia. Thus, it is important that potentially promising varieties be evaluated by researchers and only the best be promoted to farmers. There are some types of technology that can be tested directly and on-farm, such as farm implements. It is also possible to test the "regional uniform variety trials" simultaneously both on-station and on-farms in different areas of

the country. These trials usually consist of a limited number of selected varieties which the international center staff considers to have wide adaptation. This method may move technology to the farms more quickly.

#### H. Research in Fisheries

In an activity as complex as the fisheries, involving a mixture of interacting populations of animals and plants, a continuous series of decisions and judgments must be made that have technical, scientific, political, social, and economic implications. These decisions often have a direct and significant effect on the welfare of the people of the country, the amount and nutritional content of their food supply, the profits or losses of their business ventures, and their jobs.

These important decisions can only be made in a rational and effective manner if certain elements of information are available about the fish and their environment. This information can only be obtained through continuous, strictly controlled, orderly, and precise measurement of certain variables through scientific research.

The Ministry of Water Resources, Fisheries and Forestry, and the Department of Fisheries must have the results from this research to carry out their responsibility effectively. That responsibility is to make it possible for the nation to obtain the optimum amount of food, jobs, and income from fishery resources, and to protect all the many components of those resources and the environment from degradation or destruction.

The Department of Fisheries does not have the capacity, the facilities, or the trained manpower to carry out this responsibility, and its research program at the moment falls far short of satisfying the nation's needs.

It is therefore proposed that assistance be given to The Gambia to build a research capacity in fisheries science appropriate to the country's needs. This should be started modestly, and built up as needs and resources allow.

Such a plan will first require the design of a national fisheries research program. It should be emphasized very strongly that this should not be a copy of some other nation's program. Gambia's program must be built with strict attention to the urgent local problems to be solved, and strong realism about the ability of local people to carry it out. Emphasis should be placed on highly applied research, designed to help the industry to supply fish as food more efficiently, and to help government decision makers devise regulations to prevent depletion of exploited stocks and to protect the natural environment. For example, the offshore fishery for sardinella would be assisted if

it had sea-surface temperature data available at the right times, since the appearance of this species is controlled in part by surface water temperature. Continuous length-frequency measurements of some of the most important species are essential in interpreting population size changes that might require shifts in regulatory policy. These and other applied programs would be an appropriate start for a Gambian research group. If the programs were intelligently chosen and the research carefully conducted, the results could be significant.

There are a great many other scientific programs that could, to one degree or another, be useful to the development and management of the Gambian fisheries. It is suggested that the country not address the more complex and theoretical aspects of population dynamics and other complicated matters at this time, but rather become competent in the collection and manipulation of necessary data. At first the assistance of scientists from other countries, already skilled in population dynamics, could be used on some mutually acceptable basis. Senegal in particular has a competent and active fisheries research program. Discussions should be carried out on the kinds of cooperation that could be developed involving the use of data collected by both countries.

It is important to note that the Gambian national fisheries research program suggested here does not start with the building of laboratories or the purchase of research vessels. The design of these facilities depends entirely on the kinds of research to be carried out, and only when the plan has been completed, should laboratories and other research tools be designed and built.

Those in charge of creating the design of this program should seek the advice of the fishermen, the industry, the environmentalists, and others with a stake in the results. An expert from a country with a successful program should lead the effort.

#### I. Agricultural Extension Programs

Extending improved methods of farming to villagers has been undertaken for decades. It is easy to criticize the extension efforts that have been made; however, the fact remains that an introduced crop, groundnuts, now occupies about one half of the cultivated area and an introduced practice, animal traction, is used by more than half of the farmers to till their crops. Each donor has his own concept of how to most effectively do extension work. NGOs also do a considerable amount of extension work often with highly subsidized or free inputs for the farmer.

USAID's mixed farming project (MFP) was a commodity extension approach that often promoted the production of maize with subsidized and free inputs for demonstrations on farms. However, a key element of this project was to ensure that inputs

of seed and fertilizer were available to farmers. This project also placed considerable emphasis on livestock research, forage research and promotion, and agricultural statistics.

In 1980, before the MFP, the total hectares planted to maize was 5,400. During the last year of the project (1986), the maize hectares totaled 16,600. After the project ended, the maize hectareage dropped to 13,000 in 1987/1988 and increased slightly to 13,600 in 1988/1989. It has been reported that the American technicians themselves did much of the field work with farmers.

Since maize production has declined since the end of the project, critics say that the mixed farming effort was not sustainable and therefore not an appropriate approach. However, other observers report that the decline in the genetic capacity of the open pollinated varieties (NCB, JEKA, CROSS 7434, and MAKA) is to be expected over a period of several years. The same observers suggest that new seed should be made available to farmers. Other critics suggest that the lack of available chemical fertilizers and the farmers' preference for subsidized or free inputs, have also contributed to the decline in maize hectareage. However, maize hectareage remains at 2.5 times what it was before the project.

The Gambian agricultural research diversification project (GARD), a new USAID project, was started in 1986. The purpose of this project is to "...test, generate, adopt, and promote the adoption of improved crops and livestock technologies that meet farmers' needs and expand and diversify the Gambian's agricultural economy." The GARD project has made a concerted effort to institutionalize by working through the Gambian government.

The GARD project promoted the FSR/E approach. This method requires a multi-disciplined approach with a social-economist, an agronomist, a livestock specialist, and an extension specialist forming teams at the national and village levels. This approach also includes the use of farm surveys to determine farmer constraints and the use of on-farm trials. Because of a shortage of qualified staff, it proved impossible to fill positions at the research center level (Sapu and Yandum) and at the village levels (four sites). The Gambian government's inability to fund the necessary fuel, vehicles, and staff per diem allowances proved to be major problems.

The World Bank (IBRD) has placed a technical advisor in the Department of Agricultural Services, and is promoting the training and visit (T&V) system of extension work. The T&V system was developed in Asia in a highly structured irrigated agriculture that produces two or three crops per year. In an annual rainfed agriculture, such as occurs in The Gambia, it appears to be less adaptable. However, it has been modified and

elements of the T&V system are being used by the Department. The Jahaly Pacharr scheme is also using the T&V system. This World Bank technical assistance is in connection with the second structural adjustment credit program of \$23 million during the period 1988/89 - 1990/91 to support the GOTG economic recovery program. This is a very broad program that addresses several sectors of the economy other than agriculture.

In 1988, the GARD project had placed emphasis on a commodity approach as they reduced alliance with the FSR/E approach. However, the project continued to emphasize on-farm trials for selected crops. Both research and extension workers cooperated in these trials. Fifteen rice trials were conducted in 1988.

In 1989, the GARD project adapted the farmer innovation technology testing program (FITT). This program includes advising the DAS and the NGOs of certain available technologies (those the researchers feel are ready for the farmers). The presentation of fifteen available technologies was accomplished at a national meeting in May 1989. The NGOs and DAS selected the appropriate technologies for the farmers with whom they worked. They then selected cooperating farmers for on-farm trials. The GARD project is furnishing free inputs including seed and fertilizer for these trials.

In summary, between 1981-1989, the following extension approaches have been followed:

- o Commodity Approach (used by the mixed farming project)
- o T&V system (promoted by the World Bank/FAO advisor, 1987-89)
- o FSR/E system (used by GARD in 1986-87)
- o Commodity approach with NGOs and the Department of Agriculture Services used by GARD 1988-89, also known as the FITT

It appears to this consultant team that the commodity approach is best adapted to The Gambia. The T&V system and the FSR/E system are too demanding on the Gambian government in terms of staff, fuel, and vehicles to be practical. The team concurs with the multi-discipline approach to extension, however, four-person teams cannot be assembled with The Gambia's current shortage of qualified staff.

The commodity approach may be described as a specific education program on a specific crop, i.e. maize, sesame, etc. It may be led by one research/extension specialist, or it may involve two persons cooperating, such as an agronomist and an agricultural economist. However, the profitability to the farmer

of the program should be carefully determined by partial budgeting or other means. The person/leader of this effort should also serve as the lead trainer in the field-level staff training sessions.

The lack of effective coordination between research and extension has been noted as a problem by several observers. This coordination can best be done at a higher level rather than at a lower level (the multi-discipline team).

It also appears that there is limited coordination between the World Bank's effort in extension, which emphasises the T&V system, and USAID's GARD effort that has promoted FSR/E and commodity extension approaches with DAR. The World Bank's advisor works with DAS. The Ministry of Agriculture officials, at a senior level, need to ensure coordination of their extension efforts.

**CHAPTER VII**

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**RECOMMENDED POLICIES TO MAKE PRIVATE, FOREIGN,  
AND GOVERNMENT SECTORS MORE EFFECTIVE**

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## CHAPTER VII

### RECOMMENDED POLICIES TO MAKE PRIVATE, FOREIGN, AND GOVERNMENT SECTORS MORE EFFECTIVE

#### A. Introduction

The ultimate objective of agricultural diversification is to increase food security, farmer and fisherman income, the gross domestic product, and export earnings through the shipment of more or higher valued agricultural products.

This chapter on policy recommendations has been prepared taking into account the economic environment of The Gambia and the spirit of the economic reform program. The following characteristics, are considered most important in the policy area:

- o The Gambia is a trading country.
- o It has free trade with few restrictions on imports or exports.
- o It has freedom of movement of the local population and foreigners.
- o It has a free and open economy with a currency that is allowed to reach its market value.
- o It has an economy that is becoming more free of subsidies and less burdened by inefficient parastatals
- o It has much opportunity for increased trade with neighboring countries and the rest of the world, particularly the more mature and newly industrialized countries.

The Gambian economic reform program is working. Foreign exchange reserves are increasing, losses on government parastatals are declining, and the GDP is growing. The policy recommendations made in this report are designed to enhance the performance of the agricultural sector so that it can more easily keep pace with the expanding service and industrial sectors. Suggestions for direct government investment in programs or projects have been avoided. Activities that are considered the role of government have been reviewed to make them as economically feasible as possible for the GOTG.

## B. Recommended Policies for Field and Horticulture Crop Sectors

As a general policy for field crops, the GOTG should target the major food and cash crops for attention in research and extension programs.

### 1. Millet Production

Millet is the most important cereal crop in The Gambia in terms of hectareage and production. It is relatively resistant to drought and thus assures a stable source of household cereals year after year. Early millet matures early in the season and is thus one of the first cereals available to end the "hungry season."

Increased efforts to develop improved varieties of millet are especially recommended. Variety trials have been conducted for some years but no significant research breakthrough has been achieved so far. There has been limited progress in identifying varieties of millet that outperform local cultivars, especially under low soil fertility and low rainfall conditions. The highest average recorded yield of millet in The Gambia during the last ten years was under 1300 kg/ha.

It is recommended that the GOTG redirect research and extension efforts and direct additional manpower and resources to the improvement of this very important cereal crop in order to realize its full potential under Gambian conditions.

### 2. Commercial Horticulture and Foreign and Domestic Investment

a. The following are some of the characteristics of this proposed policy for developing commercial horticulture and promoting increased foreign and domestic investment:

- o Policy is in concert with the GOTG-stated objective to attract private investment and to raise agricultural productivity.
- o Profitable investment potential in vertically organized fruit and vegetable export.
- o The Gambia's comparative advantage: stable democracy, open economy with an attractive investment code, low labor costs, transit and transport not a major obstacle, favorable climate for production of a variety of vegetables and fruits, experience as a trading partner, and favorable location vis-à-vis both regional and European markets.

- o Transfer of technology via private efforts is likely to be cost effective and to impact areas from which further diffusion and adoption would occur.
- o The primary production of fresh fruit and vegetable for export can provide inputs for a secondary production process whose by-products are inputs to a tertiary process. For example, producing fresh fruits for export will result in a by-product of imperfect fruit as it is graded to guarantee the highest quality price. Imperfect fruit provides the input for a pulping or juicing operation. The resultant waste from these processes provides feed for livestock and poultry enterprises, producing milk, meat, egg, hides, and skins that have additional market value.
- o Policy of minimum government intervention; private sector initiatives in this area are going well and should continue.
- o Increased efforts to develop commercial horticulture and attract foreign and domestic investments (tax incentives; addressing the problems of lack of cargo space, input supply, airport storage facilities; occasional foreign expert technical assistance in special problem areas).
- o Simultaneous development of small and large growers. Small growers need access to the overseas markets and producers need the small growers to increase their export capacity.

### 3. Maize Production Program

Maize research is a notable success story in The Gambia following the introduction of the MFP funded by USAID. The development of good maize varieties coupled with an intensive promotion campaign led to an increase of maize hectareage from 5,900 ha. in 1980/81 (before the MFP) to 16,600 ha. in 1985/86 (end of MFP).

The final external evaluation of the MFP indicated that the project was instrumental in raising the production/productivity and preparation of maize in The Gambia, thereby increasing and diversifying food crop production. It developed and refined the technology of experimentation with and extension to farmers and producer organizations, and it established innovative production techniques in mixed farming.

Following the completion of the MFP, the hectareage planted to maize dropped to 11,100 ha. in 1986/87. It rose again to 13,000 ha. in 1987/88 and 13,600 ha. in 1988/89. The decrease in

hectareage after MFP was attributed to inadequate supplies of fertilizer, and untimely deliveries.

It is apparent that the Gambian farmers have found maize a profitable diversification crop and have adapted it into their farming systems. It is recommended that GOTG and donor agencies continue their support to the maize program.

#### 4. Support Sesame Production Program

Sesame is a crop with potential to increase rural incomes, raise agricultural production, boost foreign exchange earnings, and help diversify the base of the economy.

Women are the primary growers of sesame. With prices of sesame in the \$400- to \$900-a-ton range, the potential exists for increases in the incomes of rural women.

There are also other private sector investment opportunities in agribusiness and services, such as sesame processing and the sale of sesame oil, cake, seed, and nuts.

Since its promotion by the CRS (supported by USAID) in 1983, sesame planting has increased from about 30 ha. to about 12,000 ha. in 1988/89.

Previously, marketing was a constraint, but this year private traders have started buying this crop. It is recommended that GOTG and donors continue to assist in the development of this very promising diversification crop.

#### 5. Rainfed Rice Production

Rice is the preferred cereal for consumption in both rural and urban areas, and there is an increasing demand for rice.

The Gambia does not produce sufficient rice to meet domestic demand and, as it had for many years, must import. In 1988, The Gambia imported 105,000 metric tons of rice, including 16,000 tons through food aid. About 65,000 tons were re-exported to Senegal.

The Gambia has shown an interest in increasing the domestic production of rice by developing the capability to produce it using irrigation and high technology. Unfortunately, experience to date has not indicated that The Gambia can yet produce rice under such conditions at reasonable costs. The major rice production schemes in The Gambia have been unable to produce domestic rice that is cost competitive with imported rice.

On the other hand, the production of rice under rainfed conditions offers promising possibilities. It has a low capital investment and requires only medium labor inputs per unit area.

Rainfed tributary valleys and the periphery of the Gambia River flood plain contain roughly 25 percent of the total potential rice land. In western Gambia, they are the principal locations of rice production.

Rainfed rice is cultivated exclusively by women. Rice yield in The Gambia is about 1.5 tons per hectare, while the potential is near six tons.

It is recommended that the GOTG and donor agencies continue to promote the technology for rainfed rice, for wider farmer adoption, and to encourage the continuation of rainfed rice research.

#### 6. Wider Range of Food and Cash Crops

The introduction of new crop species from foreign lands has played a very important role in every developed agricultural economy. For example, soybean, now a major crop in the United States, is not a native of the Americas but was introduced from the Orient and the successful introduction of sesame into The Gambia was a result of the introduction of new sesame varieties from the Sudan, Nicaragua, and the U.S.

It is recommended that the DAR systematically identify, introduce, and test a wider collection of new species and varieties of potentially important crops to further the agronomic diversification efforts. For example, varieties of crops in demand by the export market in Europe and elsewhere, not yet grown in The Gambia, should be introduced and tested to determine their adaptability under Gambian conditions and their potential for commercial exploitation. A plant introduction section should be established within the DAR to handle this task.

#### 7. Cotton Industry

The performance of the cotton industry under GOTG and donor-sponsored projects has been disappointing; these projects failed to achieve their physical targets. While the area planted and maintained increased from 450 ha. in 1975/76 to 4,603 ha. in 1985/86 corresponding yields per ha. fluctuated between 532 kg/ha. in 1983/84 and 1,034 kg/ha. in 1981/82. Total production also fluctuated, between 292 tons in 1975/76 and 2,642 tons in 1981/82. Similarly, utilization of the 10,000-ton cotton gin remained low with the highest capacity utilization of 26 percent occurring in 1981/82.

The present cotton operation is beset by problems of inappropriate pricing policies, a deficient input distribution system, and inadequate extension support services. It is recommended that GOTG encourage the privatization of the cotton industry in order to convert it to a profitable enterprise.

#### 8. Small Fruit and Vegetable Growers and Large Producers

The following are some of the elements of this policy recommendation to encourage linkages between small fruit and vegetable growers and large producers who have access to overseas markets and technologies:

- o Simultaneous development of both small and large growers.
- o Small growers need access to the overseas market and technologies through the large producers.
- o Small producers can supply some products more efficiently, and large growers can produce other crops more efficiently; each should concentrate on what they do best.
- o Increased export output should be targeted.
- o The transfer of technology from private sector efforts is likely to be cost-effective, and likely to impact areas from which further diffusion and adoption would occur.
- o No interference with private sector initiatives. The private sector indicate that they prefer less government involvement.
- o Coordination among efforts of NGOs, research, and extension should be strengthened to help small growers and to link the activity to commercial growers.
- o The services of an experienced individual should be obtained to focus on external networking and research/extension linkages for horticultural crops.

#### 9. Technical and Donor Assistance for Women

The GOTG must recognize the important role that women play in agricultural production in The Gambia, and GOTG policy should assist them in increasing their productivity.

Credit for inputs and machinery is often cited as a constraint among farmers, and especially among women farmers. Some of the inputs women farmers may purchase on credit include rice seed, vegetable seed, fertilizer, implements, and permanent fences for gardens. Most credit schemes in The Gambia have

failed to be sustainable because of low loan repayment rates. Most past credit schemes have also been "top-down" operations, whereby funds, generally from a donor source, are loaned to the farmers.

It is proposed that these credit unions consist of women farmers who save at the credit union as well as borrow from it. The donor should provide technical assistance to train village committees and union managers. A limited amount of commodities-office equipment, vehicles for advisors, and safes should be supplied. It should be understood that this approach will take 10 to 12 years to develop, but it will be sustainable if the necessary training is done.

A credit program for women rice and vegetable farmers should consider the following:

- o Credit is one element of development and increased production; other elements are effective research and extension systems, and markets for increased production.
- o Cooperation is essential. Credit unions must work closely with research, extension, and marketing agencies.
- o Training is essential. The training of leaders and staff is a key to establishing a small farmer credit operation. Training also performs a management role in that it sets policies and procedures. All training should be followed by field visits. Manuals and other training publications are necessary.
- o Local involvement is essential. The local credit unions will be loaning their funds, and loans will be approved by local credit committees.
- o Technical assistance should be advisory. The TAs will advise on how to organize the system, and evaluate loan and implement policies, but not how to manage the local credit unions.
- o Credit needs should not be subsidized. No government or donor funds should be used for loans. The credit unions should loan their own funds.
- o Interest rates should not be subsidized; they should reflect the local money market. Savings rates will be lower than loan rates and should remain competitive.

The ultimate objective will be to raise rural living standards by making the women farmers more productive through savings and loans.

## C. Policy Issues for Livestock Sector

### 1. Animal Health and Nutritional Care Delivery and Meat Inspection

Farm level animal health and nutrition care delivery and market-level slaughter and meat inspection should be provided as a government service, paid for indirectly by the users in the form of head tax and slaughter fees. This service should include vaccinations, anthelmintic treatments and extension of other animal health and nutritional management practices including provision of inputs, which have been subsequently proven cost-effective for herd production increase by the epidemiological studies being conducted by ITC or others. By definition, this excludes the feeds and inputs for animal fattening or marketing ventures. The government should also continue to upgrade meat inspection at the major urban and larger village markets now being inspected by DLS. This service should be paid for through existing cattle head tax and slaughter fees on marketed animals, and adjusted periodically depending on the services rendered, materials provided, and the number of animals being marketed. This exception to complete privatization is considered prudent given the need for broad disease preventive coverage and continuous sanitary meat control.

The dual benefits of this policy would be increased production efficiency and the potential for reducing or stabilizing the herd numbers while maintaining sufficient production to meet the community needs for milk, meat, eggs, draft, dung fertilizer, and savings for cash and social obligations (USAID/SDPT, 1983).

Animal health and nutrition have been universally identified as having the greatest potential for increasing animal production in the developing countries, specifically in The Gambia. Selective application of these measures has also proven to be cost effective. However, to apply the practices as proven, the inputs must be available to the farmer/herder. These inputs include well trained personnel posted near the farmer/herder, appropriate economical transport such as mobilettes, vaccines and medications, nutritional supplements, and proper storage. Provision of the feed supplements to the DLS posts, located at each of 43 Livestock Owner's Association (LOA) villages, should be contracted to private feed mills (which presently have excess capacity) and contract delivery to traders and agents who could backhaul feed to the DLS/LOA posts after delivery of livestock to the urban areas.

### 2. Integrated Range, Crop and Forest Land Management

The GOTG should mandate a unified policy on early burning, deferred grazing, and use of crop residues by the

involved departments, (the Department of Livestock Services, the Department of Agriculture, and the Department of Forestry). The policy should duplicate the traditional system, as closely as possible, since this system has outlived many efforts to replace it. The GOTG should monitor (not control) the range being used by this very variable and variable traditional system to document the effect of different burning and land and residue use patterns. That the policy should have flexibility to change as new evidence is gained from experience is essential, but all departments should be obligated to continue supporting the same policy, which should result in minimal interference with the traditional system. A monitoring and research committee made up of one technical representative from each department should be responsible for defining and refining the policy.

The early burning promoted by the foresters before the last rains when only spotted burns are probable should be accepted and promoted by all departments. The DLS should promote the practice of deferred grazing for one month to six weeks on one-third of each village's common grazing land just after burning (rotating the land burnt each year when possible within the traditional system). Farmers and farmer/herders should continue to make cereal crop residue fields available for supplemental grazing during the period of deferral of the forest or pasture.

There are farmer/herders as well as government employees using and promoting different range resource management practices, usually for good reasons. (See Dickie, A. et al, 1987). Early burning is practiced by some farmer/herders and foresters to protect late harvested crops and woody plants from the late hot fires. Other farmer/herders burn later to clear away the canopy of shade left by unburned tall grass so new growth will come earlier with the first rains. Protection of village compounds and clearing of new and old crop lands are more reasons for burning at different times.

Crop residues are utilized in large part by the livestock, including grazing cereal residues in the field just after harvest. Due to the low quality of the cereal stalks, transport, handling, and storage is not economically justifiable. However, much of the groundnut hay is harvested and stored for draft animals or sale because of its higher nutritional and monetary value. Most of that which can not be collected and stored is consumed directly in the fields. These crop residues continue to be an essential part of the animal and agricultural system because they provide feedstuff during the time of year when natural range resources are becoming scarce. That is one of the reasons why greater densities of animals can be (and are) maintained in areas as the farming intensity increases. The farmer also gets the benefit of the increased tonnage of dung fertilizer that the livestock deposits on his fields from the forage consumed in the forests and pastures.

It is not the place of the government official nor range specialist to specify exactly what action the farmer/herders should take in all cases, but they should demonstrate type results by monitoring farmers' actions and clearly establishing cause and effect relationships between these actions and a more productive environment.

Simple, but effective monitoring of the range in selected areas of differing use patterns can serve as the best research laboratory to test the null hypothesis that the tradition system is the best until an introduced technology is proven better on a technical as well as socio-economic basis.

### 3. Private Marketing System for Livestock

The GOTG should complete the return of the livestock marketing system to the private sector by offering the central abattoir for contract management, rent, or sale to either private individuals or the butcher's association and by instructing LMB to abandon the two holding grounds (intended for breeding ranches) to the traditional private village farmer/herder users. The government should continue the required meat inspection service and sanitary slaughter through DLS enforcement.

In present practice, LMB has reluctantly accepted that the private traders and agents can more efficiently provide the marketing service between the farmer/herder and the butcher with the help of the traditional credit system described in chapter III. LMB is now using that same farmer/herder credit for an average of 45 days for provisioning the government armed forces, several other government organizations, and the tourist trade of an estimated total of 200-300 MT of beef per year. LMB continues to require slaughter service at the central abattoir, but at a loss of an unstated amount. The meat inspection service is provided by inspectors from DLS in collaboration with LMB. The private management of the abattoir, collaborating with LMB, could determine a just slaughter fee to both pay for the abattoir operation and maintenance, and provide a cost-effective service for their fellow butchers.

The government should discourage the LMB plan to operate two breeding herds of 2000 head each on the two holding grounds (ranches) that would be in direct competition with private producers for the limited natural forages on common grazing land, as well as direct competition for the N'Dama export market, should the latter again become viable. The provision and marketing of N'Dama for export should also be done by the efficient private marketing system, while the international financial arrangements would need to be handled by LMB or some such government agency. The health testing and certification could still be provided by DLS as before.

The Belgian partnership tannery should be allowed to buy hides and skins domestically from private dealers who could combine their pick up and transport of hides and skins with the livestock hauling. LMB shares could be sold to local private investors. The completely private company could also negotiate for imports of raw hides and skins to help increase needed efficiency of scale. LMB should either be given full authority to regulate, or at least to monitor, the animal product imports and exports, which it has not yet been able to do effectively for lack of authority.

#### 4. Free Market Imports

The GOTG should allow free market imports of animal products, feed grains, and other commercial animal production inputs to facilitate the most economical supply of animal protein for the general population and the special needs of meat, eggs, and milk for the urban and tourist market. Caution should be taken to ensure that food grain and other direct human consumables take first priority for limited import facilities and personnel. A GOTG agency (DLS, LMB, or another) should regulate the quality and sanitation level of these imports while monitoring the quantity imported.

Due to the limited quantity and quality of domestic feed grains and agroindustrial by-products, and the present use of foreign exchange for imports of animal products and feeds, it is deemed prudent to permit an unhindered free market access to stimulate the most efficient imports for the good of the general consumer. Because poultry broiler or layer businesses can be initiated rather quickly, farmers and commercial producers in the urban surroundings can intensify production to meet the urban and tourist demand when prices become favorable. This demand might include milk and mutton or goat and beef, as well as poultry. While most of the urban demand, and 80 to 90 percent of the tourist demand for beef and mutton or goat is presently met locally, milk, poultry, and eggs must be imported. Some unofficial mutton imports along the border are reported at festival time, but it is believed to be a small part of the annual production.

Expected activities as a result of this policy include: reduced consumer prices for animal products for the general population until the international animal product prices go up; increased commercial broiler and egg production; semi-commercial milk production from traditional cow herds kept near urban areas with minimal supplemental feeding to reach their optimal genetic potential; and semi-commercial mutton feeding in urban and farm compounds for the specialized Tabaski market.

This policy would have little or no effect on beef supply over the present traditional supply, but some entrepreneurs might use the resulting cheap feed source to maintain and grow speculation cattle bought in the season of low cattle prices (due to farmers' need for cash at planting or other special needs) and sold a few months later at a heavier weight at the higher terminal-market price. This cattle trading is a profitable business for persons with capital to invest as shown in the results of cattle feeding supported projects in several west African countries, but it does not contribute significantly to increased production or offtake (see low monetary and nutritional return potential in table 21 of chapter VIII). It may reduce the potential income to the farmer/herders who might have maintained their animals until market weight and have sold them at the higher price if they had had access to capital to meet their seasonal needs. While this cheaper imported feed source may also help the farmer/herders supplement some animals through this period, no special support is recommended.

#### D. Recommended Policy for the Fisheries Sector

##### 1. Fishery Resources in the EEZ

The GOTG should revise its policy to control foreign fishing in the EEZ, and its consequent inability to benefit fully from its fishery resources.

The Gambia has a valuable natural renewable resource in the fish stocks off its shores, out to 200 miles. This resource is not being used well, and the nation is probably losing much of its value in food and income. A principal reason for this is the activity of foreign vessels. Some of these vessels fish legally in the EEZ, but control over their activities and the income derived from the fish they remove from the zone is probably in many cases short of the true value. Other foreign vessels fish illegally in the zone, and they may be taking damagingly large quantities of fish.

There was a consensus among government and industry officials consulted in this study that there were too many vessels fishing legally or illegally in the Gambian EEZ, and that they are catching more of the demersal fish than that resource can sustain. (The stocks of most midwater fish, on the other hand, appear to be able to support the present level of fishing at least, and perhaps increased rates of exploitation; this issue requires separate consideration.)

It appears urgent that the government examine the truth of this matter, since the stocks may be damaged severely if in fact too many vessels are fishing and that The Gambia may be losing significant national income each year. (see annex 2).

The decision on the proper level of fishing, and thus the number of licenses issued and the income derived from them, depends on having trustworthy estimates of the maximum sustainable yield (MSY). Without these data, estimates of the condition of the stocks are impossible to obtain.

Whatever the number of licenses deemed appropriate to sustain the resource, the conditions under which they are issued should be reviewed. The foreign vessel receiving a license should be required to fulfill certain obligations. These obligations include: (1) making accurate and full reports of the amounts of fish caught, by species, and the amount of fishing effort expended. This is already a requirement, and licensed vessels are supposed to carry an observer whose duties include keeping such records; in reality however, this system is not effective; (2) reviewing ways to implement regulations requiring license holders to train a number of Gambians on their vessels, in order to build up the competency of local fishermen so that they can eventually man Gambian vessels in the EEZ; and (?) requiring foreign vessels to land a certain amount of fish in The Gambia so that this country can benefit from the food and the monetary value derived from processing the fish in this country. It is recognized that this latter suggestion depends on there being a market to absorb the catch landed, and on the availability of docking and processing facilities in Banjul, but planning should be started to make this project feasible as early as possible.

This policy has no meaning if the regulations and laws that spring from it cannot be enforced. The Gambia presently lacks the ability to implement necessary enforcement. There are strong incentives for the vessel owners to understate catches, but there are methods of increasing the accuracy of reports, and these should be investigated. The question of penalties for non-compliance to Gambian rules should be reviewed, and a decision made whether present regulations are strict enough.

Of great importance is the matter of the charges imposed for the right of foreign vessels to fish in the Gambian EEZ. It is suspected that the amount of income now being derived is significantly less than the resource is worth. There are several methods of charging the "rent" for fish catches, and these should be reviewed. The marine unit (Ministry of Defence) is the unit of enforcement, and in the past has had inadequate resources to fulfill its responsibilities.

The use and management of fishery resources lend themselves to cooperative action, and indeed demand cooperation among the nations sharing the resource and its harvest, if optimum use and protection of the resource is to be provided. This is because fish populations overlap national marine boundaries in their general distribution, and because fish exhibit seasonal

migrations. As a consequence, the actions of one nation, whether in terms of exploitation of a stock or damage to it by destructive fishing methods or pollution, can affect the use of that stock by other nations. Without formal cooperative agreements, and goodwill implementation of such agreements, all the countries involved in a fishery for a shared stock will be losers.

It is therefore suggested that The Gambia seek substantially increased cooperation with its neighbors, and with distant foreign nations who fish in its waters with its permission.

The strongest cooperation should clearly be with Senegal. A start has been made through the agreement involving the reciprocal permission for limited number of vessels of each nation to fish in the other's sovereign waters. Senegal also has a much greater capacity than The Gambia in the observation, monitoring, and control of fishing in the EEZ.

Consideration should be given by The Gambia to combining the two countries' resources in support of these activities. It is recognized that a great deal of fishing takes place by Senegalese vessels in Gambian waters, and that cooperation in monitoring and enforcement would involve actions against the nation's own vessels, but methods should be studied to develop fair and workable arrangements.

## 2. Appropriate Fisheries Research

An enhanced fishery research capability is essential if the country is to make optimum use of its fishery resources, and is to protect the environment from the damage caused by overexploitation and unwise practises. But care must be taken not to put into place a program or facilities so large and elaborate that the critical essential research components are not effectively handled.

The task of making decisions concerning the optimum use of a natural resource requires a body of knowledge that can only be obtained through research. The present research program and the capability of the Department of Fisheries are inadequate to the task of extracting the full value for the nation from the rich fishery resources, and to protect them from overexploitation and ecological damage.

An expanded research capability is therefore necessary. However, the kind of research that would probably be most useful and the facilities and staff most appropriate to the task, need to be carefully considered. It is believed that the kind of research urgently needed is of a very practical and applied nature, and that at this stage academic and theoretical investigations are inappropriate.

It is therefore suggested that the research program for the Gambian fisheries not begin with the building of a laboratory, but with the careful planning of the program. Advice is particularly needed from those in the industry: artisanal fishermen, industrial fisheries operators, and aquaculture industry people. Their problems have to be addressed in the design of research specifically directed to practical solutions.

Only after this task has been completed can the kind and size of facilities be designed and built, and the scientists trained and recruited. At the moment there are few qualified Gambians who could take over the necessary investigations on stock assessment, fish population dynamics, statistical analysis, and other problems that will lead to an adequate understanding of the fishery resources, and to management programs.

In the beginning, external assistance will be required, but the program should include a strong training component to develop permanent competency by local people.

The Gambia should consider ways in which cooperation with Senegal and other nations could be extended to create cooperative research programs. Since both countries have an urgent need for information on the same stocks, combined action would be of benefit to both, with The Gambia having a particular advantage in terms of gaining experience and training. Cooperation with other neighboring and distant nations should be sought in respect to research.

A mechanism does, in fact, already exist, to facilitate cooperation in research, collection of statistics and resource surveys, dissemination of information, and other matters, in the form of the Committee for Eastern Central Atlantic Fisheries (CECAF). But its effectiveness has been destroyed by lack of support, and careful consideration should be given to ways of restoring this body.

It is suggested that The Gambia consult with other member countries of CECAF on ways of revitalizing this organization. Ideally, this should be done by financial contributions from the nations benefiting from its activities, in proportion to their abilities and the benefits gained. Alternately, the member countries could request one of the donor agencies to undertake the support of CECAF. Attempts to do this have not been successful up to now, and if this continues to be the case, it is suggested that The Gambia and the other member nations try to organize a consortium of donors to share in the support of CECAF, so that the burden would not fall on any one of them. It would be desirable for the African member countries to contribute at least a token amount in addition to the contributions of donors.

The Gambia may be in an unusually favorable position to take the lead in the effort to revitalize CECAF since its president is an effective and respected chairman of the Economic Community of West African States (ECOWAS).

### 3. Development of Aquaculture

There is a strong trend throughout the world to shift from the present dependency on capture fisheries for supplies of fish to obtaining increasing supplies from fish farming. It is recognized that very significant amounts of fishery products will continue to be obtained indefinitely from the capture of wild stocks, for the reasons discussed earlier in this report, but attention is turned intensely to farming systems for fish, and crustaceans and molluscs, and significantly greater supplies of food will result.

There are no economically proven aquaculture operations being carried out in The Gambia. Some small and tentative trials have been conducted to grow fish, but they were unsuccessful. An experimental pilot operation is under way to grow oysters under cultivation, but it is still far from showing economically valid results. There is a large, well planned and well financed industrial-level shrimp farming operation under way, but it has not yet demonstrated whether it will be economically viable.

Aquaculture projects such as the above are successful in other parts of the world. That does not mean they can necessarily be profitable in this country, but it seems certain that some kinds of fish farming will prove to be environmentally and economically feasible here.

To establish which farming systems will be most appropriate for conditions in The Gambia, especially in relation to the particular social and economic peculiarities of the country, it will be necessary to plan and carry out a series of studies.

## E. Recommended Policies for the Commercial Agriculture and Agribusiness Sectors

### 1. Increased Private Investment in Commercial Agriculture and Agribusiness

In order to increase the value added to the Gambian economy by agriculture, it is recommended that the GOTG increase its efforts to attract Gambian or foreign investments and up-to-date technology in agriculture, especially in irrigated vegetable and tropical fruit production targeted primarily to the tourist and export markets. This policy is in concert with GOTG policy to attract private investment and to raise agricultural productivity.

## 2. Vertically Integrated Fruit and Vegetable Production

There is a profitable investment potential in vertically organized fruit and vegetable export. It can contribute to increased productivity, income, and export level. As stated earlier, The Gambia's comparative advantage derives from its stable democracy, its open economy with an attractive investment code, its low labor costs, its overall transport and transit capabilities, its favorable climate for production of a variety of vegetables and fruits, its experience as a trading partner, and its favorable location vis-à-vis both regional and European markets.

An increased number of the vertically integrated horticultural specialty crop enterprises would greatly increase cash crop diversification.

Government policy should allow for mutually acceptable agreements between commercial growers/shippers of horticultural products and small holders. It would be a mistake to attempt to force the contractor to accept produce from all growers in an area, or to expect all farmers in the area to participate.

The linkage suggested above is a form of vertical integration, including production on the main farm and by contract growers. In the case of exports, the vertical linkage must exist all the way from the farm in The Gambia to the wholesale buyers in the importing country. The marketing of produce for the local markets would be more informal and varied and should utilize the links already established between the major hotels, restaurants, supermarkets and the local growers. Because of the relatively small size of the locally targeted markets, the export market will be the major target.

Vertical integration in the horticultural sector is common throughout the world for many crops grown for processing. Sugar, coffee, tea, pineapple, and frozen vegetables are examples. Similar integration in the production and marketing of horticultural crops for the fresh market is more innovative. However, there are successful enterprises already established in The Gambia and more are in the proposal stage. Some have objected to the status of the farm workers as wage employees in such enterprises, especially when the projects are very large. The scale of enterprises foreseen for The Gambia are relatively modest in scale by comparison with many in other African countries and the rest of the world. Moreover, there simply is not an alternative model for achieving near-term gains in production of horticultural crops for export.

### 3. Commercial Horticulture in The Gambia

The commercial horticultural crops farm is an enterprise that combines advanced agronomic technology with labor intensity. The land required for significant production is small compared to that for field crops. Much of the labor required will be needed during the dry season, with irrigation water obtained from bore holes. The enterprise can provide cash income for farm family members. We see the export-oriented farm as a supplement to presently grown crops, coexisting with existing farming systems without disrupting them. For this reason, the vertically integrated horticultural crops farm envisioned in The Gambia will contribute to the welfare of the rural population as well as to increased foreign exchange earnings for the country.

### 4. Stimulation of Commercial Agriculture and Agribusiness

The intensified efforts suggested are in addition to the effective implementation of the existing GOTG investment incentive provisions. The policies to further stimulate horticultural enterprise investments should involve the following:

- o Investment incentives which should provide the same package to integrated farmers as to industry. In addition the same opportunities to benefit from access to inputs or tax exemptions for inputs should be available.
- o Production and post harvest technology.
- o Training of horticultural workers. Training needs for professional agriculturists was addressed in chapter VI. Horticulturalists to be assigned for service in the large-scale commercial industry need suitable training that can best be obtained at institutions located in areas producing and marketing crops similar to those grown in The Gambia.

## F. Recommended Policies for Crop Marketing and Input Supply Sectors

### 1. Privatization of the Fertilizer Distribution Sector

The policy regarding fertilizer distribution should be to continue shifting the function to the private sector until the industry has been fully privatized. This will require increased efforts to overcome the problems resulting from the limited number of private dealers participating at the wholesale level, and the large difference between the landed cost of fertilizer and the current level of fertilizer prices (the prices prevailing after the rebidding in May 1989).

The private sector should respond to effective levels of demand for fertilizer. The logistics of distribution are similar to those for rice or cement in large bags or for soft drinks in cases. These products are readily available in village markets throughout the country. The key to availability of supply and timeliness of delivery is effective demand, which requires both the willingness and the capacity to buy the product. The constraint is not primarily the price of fertilizer. A bargain price may appeal to the farmers as an attractive benefit, but low prices do not provide more than a transitory benefit unless substantial productivity gains are achieved. The farmer must be convinced that fertilizer in fact increases his net income, so that he is motivated to buy it voluntarily. Fertilizer value is limited or even worthless if not accompanied by suitable seed and cultural practices, but if properly used it will generate increases that greatly exceed the cost of fertilizer even at world market price levels. The best demonstration occurs when a farmer sees his neighbor successfully using fertilizer without direct external intervention. The government's role in creating effective demand is, therefore, to promote the combination of genetic material and cultural practices that actually result in higher yields; this is effective applied research and extension.

Despite the problems of adjustment in the fertilizer industry, the suggested policy of complete withdrawal of the GOTG from the business is vital to accomplish the following:

- o Give undistorted price signals to Gambian farmers so they can use fertilizer in economic quantities on their crops
- o Provide opportunities for Gambian enterprises to export fertilizer to Senegal at world market price and to other neighboring countries on a profitable basis
- o Make fertilizer available regularly in the villages so that farmers can purchase fertilizer when they have cash during the trading season well ahead of the planting season
- o Make it feasible to import additional fertilizer above the donated quantities on a commercial basis
- o Enable the traders (including the GCU and the cooperative societies) to judge the credit risks, maintain records and control of credit, and shift the risks of supplier credit from the GOTG to the traders or other suppliers of production credit

## 2. Expansion of Re-export Trade

Government policy should be directed to taking full advantage of Gambia's location and trading experience by

designing tax, investment incentive, and regulatory policies for agricultural inputs such as fertilizer, machinery and animal feed ingredients that would enable Gambian traders to expand the value and quantity of re-exports to neighboring countries. This would provide direct benefits in terms of employment and government revenue and would increase the scale and efficiency of farm input procurement and distribution that would benefit farmers and be a stimulus for increased production.

### 3. Collection and Analysis of Production Data and Marketing Information

The requirements for accurate and timely production data, market prices, and other marketing information will increase as the country moves toward more commercialized agriculture, and toward private sector output marketing and input supply. The policy of the government should be to concentrate on the most necessary estimates and marketing information. The goal is to obtain actually useful results, relevant and sufficiently accurate for commercial use, and to effectively employ the limited resources that are available for data collection and dissemination. As part of a diversification strategy, this prioritization should direct the available resources to information and data relevant to the crops of commercial importance; for instance, groundnuts, sesame, maize, and horticultural commodities.

However, despite past technical assistance and long-term staff training, the DOP's capacity has been greatly reduced. Several of the qualified staff have been transferred to other important positions in the MOA and to NGOs. GARD has recognized the need for additional training and is currently providing appropriate assistance to the NASS. However, the price reporting program previously started has become dormant, and while GARD has plans to assist the DOP to revive the system, more Gambian staff and TAs are needed if there is to be a meaningful, focused program of market news information.

The policy should recognize that production and marketing data require different approaches, and this means separately constituted organizations and procedures. They are obtained from different respondents and have different time requirements. Crop production data or livestock numbers and production pertain to the agricultural year or the cropping season. Marketing data are current, daily or weekly.

Both activities, agricultural estimates and market information, are appropriately conducted by the MOA Department of Planning. The NASS is an appropriate method of gathering agricultural production data. However, NASS ought to be refocused to include the critical aspects mentioned above, and to further the diversification effort and the relevance of some currently

gathered data. For example, the division of agricultural data by ethnic classification is interesting and perhaps useful in some other way, but it is hardly relevant as a basis for guiding the research, extension, and educational efforts designed to increase diversification and productivity of agriculture in the country.

To be meaningful for situation and outlook analysis and for projections, the data and information obtained must be analyzed and put into perspective. There are valid reasons why the Department of Research, or any other department, should have analytical capability. But, the Department of Planning should have the responsibility for interpretation as well as collection of the data and information. Therefore, the Department of Planning should have three functions relating to statistics and marketing information: agricultural estimates (NASS), marketing information, and situation analysis and projections. Projections are less complicated than forecasts for the science and art of statistical and economic analysis. Some projections, or forecasts, are nonetheless, essential for guiding government planning for its own activities and for informing the agricultural industry and the general public.

#### G. Recommended Policies for Research, Education, and Extension

##### 1. Staff Training

Plans should be developed to upgrade staff with the necessary academic education. Government staff needs upgrading to B.S., M.S., and Ph.D. levels to accomplish the agricultural diversification tasks.

It is suggested that each director, with the cooperation of the USAID technical assistance advisor, review his staffing patterns, and the qualifications of the persons in these posts. Each director should then develop a plan to provide the education necessary to train the senior staff. This means developing a long-range training schedule whereby all staff would be educated to the desired level.

This plan should also provide for OJT training by senior advisors and researchers. In order to accomplish this task, the GOTG and the donor agency will be required to make long-term commitments. A bi-monthly training and supervision meeting for all field staff should be the policy of MOA and the involvement of DAR, DAS, and DLS should be encouraged. This training effort will require an increase in the GOTG budget for training materials, bulletins, transportation, gas, and overnight lodging allowances. It is suggested the GARD's planning and budgeting system be used to ensure that funds are available on a timely basis for the field training. It is recommended that a total of 15 days of training per year be planned. These bi-monthly

training sessions should be of two- or three-day duration and should be related to the agriculture season. They will also serve as a supervision and management function.

## 2. Research/Extension Coordination

The deputy permanent secretary should coordinate research and extension activities.

The lack of coordination has been listed as a problem by program evaluators during the past 10 years. In 1987, the Department of Agriculture was divided into two groups: the DAR and the DAS. Many observers report that coordination has not improved since this division. It is suggested that the deputy permanent secretary hold staff meetings with the department heads to plan and coordinate research and extension activities.

The research extension liaison officer level is too low a level to ensure coordination between the Department of Planning, Agricultural Research, Agricultural Services, and Livestock Services. The concept of the multi-disciplined approach is sound; however, the policy and directions for this approach should come from a level above the director of the department, namely the deputy permanent secretary.

## H. Recommended Policies - General

### 1. Inter-Ministerial Coordination

Recognizing that GOTG promotion and support of agricultural diversification extends beyond the jurisdiction of any one ministry, GOTG policy should be to strengthen the units that most directly relate to agricultural diversification: MOA, Water Resources, MEPID, Finance and Trade, and the National Investment Board. This coordination should be extended to include the chamber of commerce and farmers' organizations. This is particularly necessary for the stimulation of private investment in value-added enterprises such as feed mills or vertically integrated horticultural farms.

### 2. Provisions for Capital Goods Replacement

GOTG policy should promote an understanding of the necessity for accounting for and accumulating funds for timely replacement of depreciable capital goods, buildings, machinery, and equipment. This is necessary to overcome the constraint by failures observed in many past projects resulting from neglecting this basic business management factor. This accounting practice should be done through the GOTG research, extension and educational programs and, for its own operations, e.g., vehicles provided the first time by a donor.

**CHAPTER VIII**

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**RECOMMENDED DIVERSIFICATION PROGRAMS AND PROJECTS**

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## CHAPTER VIII

### RECOMMENDED DIVERSIFICATION PROGRAMS AND PROJECTS

#### A. Introduction

There is an urgent need for rapid increases (at least 5 percent annually) in the agricultural sector contribution to the GDP to meet the food and import requirements of the growing population in The Gambia. This could be managed by a strategy of improving productivity of the most important existing crop and livestock enterprises; or by a strategy of introducing new crops and more intensive livestock or expanding fisheries, i.e., to diversify. The first strategy is likely to have the most impact on near-term total output from productivity gains. A small improvement in the productivity of a major enterprise, groundnuts or millet, for example, would have a large effect on aggregate output.

The National Agricultural Research Board appears to have implicitly accepted the first strategy (higher productivity, major crops, and livestock) as having the first priority for research. In its recommendations, the Board accepted the highest priority commodity results of the agricultural research priority exercise conducted by DAR/GARD with the exception of cotton which was added. The highest priority group included primarily the largest and most important enterprises measured by the value of output.

The team recognized at the beginning of this study that both broad productivity gains and new activities were important and included them in the concept of diversification presented in Chapter I. The team concurs in general with the research priorities (and their implication for extension activities) set by the NARB, but also sees the need for expansion of the variety of farm production and value-added enterprises, especially to increase employment and export earnings.

These two strategies compete to a considerable degree for the same scarce resources (capital and trained staff) available to the GOTG, which are clearly not sufficient now, to act extensively on both strategies simultaneously. Therefore, the program recommendations emphasize both the broader efforts (in terms of number of farmers involved) of the first strategy, and the development of commercial agriculture and agribusinesses. For the latter, primary reliance would be placed on experienced private investors with access to equity capital, credit, markets, technical assistance, and management. The interventions suggested are primarily technical assistants (TA) to assist the private sector development and promote linkages with small-scale

farmers and the GOTG units involved. As more staff become available in the 1990s upon return from training, DAR and other units should participate more actively in diversification activities.

## B. Recommended Agronomic Diversification Programs and Projects

The recommended agronomic diversification programs and projects support the recommended policies on agricultural diversification (Chapter VII). The ultimate objective of these recommended agronomic diversification programs and projects is to increase food security, farmer income, the gross domestic product, and export earnings.

This portion of the team's report is based on an analysis of the socio-economic and technological context under which agronomic diversification projects are implemented (annex A). It contains detailed action programs on field and horticultural crops to implement the policies stated in Chapter VII. The specific recommendations are based on the analysis in annex A and take into account the lessons learned from the review of past and present agronomic diversification projects. It also identifies the roles of public and private sectors and NGOs and their linkages.

### 1. Recommended Programs in Millet

The GOTG should intensify efforts to develop improved millet varieties that will adapt to the Gambian field conditions of low soil fertility, prevalent insect pests, and disease problems. Further recommendations regarding millet include the following:

- o Coordinate with IARC's (ICRISAT, IITA) millet and sorghum program.
- o Because of limited plant breeding facilities, initial cross-breeding will be done at the IARC. Include local Gambian cultivars as one of the parent materials in the crosses. It is essential that the selection from the segregating populations be done under local Gambian conditions.
- o Coordinate on-farm variety testing with research/extension/NGOs/farmers.
- o Improve soil fertility by promoting use of chemical fertilizers and application of manure.
- o Link varietal improvement work with CSR program in soil fertility, intercropping, and economic analysis.

- o Reduce post harvest losses through extension education.
- o Develop "convenience" equipment for processing millet.

2. Recommended Programs in Fruits and Vegetables

Programs to develop commercial horticulture can be divided by the length of time for technical assistance. Immediate short-term technical assistance will enable the GOTG to conduct a study of the profiles of commercial horticulture firms and cooperatives of small holders in The Gambia. Long-term technical assistance will enable the GOTG to obtain the services of an experienced individual who will assist commercial firms on a continuing (long-term) basis. This assistant can do the following:

- o Identify special problem areas and help request specialized technical assistance when needed. Likely areas of additional (short-term) foreign expert technical assistance are in pre-production, production, and post-harvest technology.
- o Explore feasibility of cutflowers and ornamentals production (in addition to fruits and vegetables), initially for the urban domestic market and later for export.
- o Create a forum for producers to discuss problems of common interest and the solutions. This will probably lead to the formation of a producers association.
- o Identify areas of potential donor interventions.
- o Facilitate the exchange of technical information.
- o Encourage producer farm visitation programs.
- o Identify internship programs with the Gambia College or technical schools to supply the horticulture industry with trained personnel.
- o Assist in the identification of suitable training programs for horticultural workers.
- o Assist new producers going into the business without technological preparation to obtain technical advice.
- o Assist in solving production problems on the spot within his/her area of expertise.

- o Initiate a fair system of charging fees on specialized technical services to producers in a financial position to pay for these services.
- o Arrange for the sharing of specialized technical services by producers.
- o Identify producers' common needs, such as a soils and leaf tissue analysis and laboratory and greenhouse facilities for service to the commercial growers.
- o Collect relevant foreign literature and publications and make them available to technical personnel.
- o Gather information from primary and secondary sources, and conduct overview studies.

3. Programs to Develop Commercial Horticulture and Smallholder Linkages

Mutually acceptable agreements between commercial growers/shippers of horticultural products and small holders should be encouraged. Contractors should not be forced to accept produce from all growers in an area or to expect all farmers in the area to participate. Fruit and vegetable growing for the export market is a form of agriculture for which not all growers are suited or interested.

The GOTG should promote interaction between small fruit and vegetable producers and larger commercial horticultural farms. They should also encourage linkages with research, the extension service, and NGOs. This linkage is a form of vertical integration, including production on the main farm and by contract growers. In the case of exports, the linkage must exist all the way from the farm in The Gambia to the wholesale buyers in the importing country.

4. Recommended Programs in Maize

A program should be developed to maintain the purity of existing improved maize varieties through the following:

- o Production of high quality foundation seed maize in research stations
- o Production of quality seed maize by private seed growers and premium price paid to seed growers by the government
- o Encouragement to farmers to select the best looking maize plant and maize ears in their fields for planting the following year

- o Establishment of seed storage facilities in strategic locations in maize producing areas in the country

The GOTG should develop a program to make production inputs (fertilizer, seed dressing, etc.) available to farmers in adequate amounts and delivered at the time farmers most need it. This can be facilitated through improvement of the current FAO fertilizer and other inputs acquisition and distribution centers, and/or the privatization of the fertilizer and other inputs distribution system.

The government should initiate visitation programs for leading corn farmers to visit other maize-producing countries with growing conditions similar to those in The Gambia. Also, visitors from other corn-producing countries should be encouraged to visit with the Gambian Maize Growers Association.

MOA/GARD should maintain a modest-sized maize research program to address maize problems as they occur. Vigilance should be exercised in spotting early pest and disease problems before they develop seriously. These problems could develop as maize hectareage increases.

The government should also sponsor a program to support the development of local blacksmiths in the manufacture of maize-related farm equipment by the private sector.

#### 5. Recommended Programs in Sesame

The government should continue to strengthen the Sesame Growers Association through CRS-sponsored management training programs. GOTG should also continue on-farm trials of confectionary types, paying particular attention to increasing plant population to increase yields. The MOA should coordinate the efforts of research studies and the extension services. They should also coordinate linkages between NGOs and the Gambian farmers.

#### 6. Recommended Programs in Rainfed Rice

The government should promote the use of animal traction in rainfed areas to help ease labor constraint in rainfed rice production. The MOA should coordinate the efforts of research studies and the extension services. They should also coordinate linkages between the NGOs and the farmers.

The GOTG should continue research efforts in western Gambia to develop a management package appropriate for women growing rice in rainfed rice growing areas. They should also continue research on fertilizer use efficiency and environmental characterization of rainfed rice in the country.

The introduction of new technology such as chemical weed control, which has a possible negative impact on the environment should be examined critically. The Gambia River is one of the most important natural resources in this country. The use of herbicides may end up in the river polluting and poisoning wildlife and fishlife in these waters. The use of cultural practices to control weeds should be maximized before resorting to chemical control. Extension education should include training on methods to reduce post harvest losses.

#### 7. Recommended Programs in Plant Introduction

A plant introduction coordinator in the DAR will coordinate efforts to bring new species of cash crops of potential importance into the country and to test these species in order to further diversify agronomic programs. For example, varieties of tropical crops in demand in Europe and other potential export markets but not grown in The Gambia could be introduced into the country and tested for adaptability under local conditions and to determine their potential for commercial exploitation.

This activity should be linked with existing DAR programs (horticulture unit, legumes/oilseeds program, upland cereals program, cropping systems resource management program, seed technology unit). Promising species resulting from the plant introduction program will be further researched by the various programs already established in the DAR and the results disseminated to DAS and various NGOs who will do further testing in their respective villages.

#### 8. Recommended Programs in Cotton

The government should encourage the privatization of the cotton industry by providing tax incentives to the private sector.

### C. Priority Discussion of Potential Livestock Interventions

#### 1. Research

The International Trypanotolerance Centre is doing a wide variety of research on cattle as well as collaborative studies with DLS and several universities on small ruminants and equine species, which is specifically applicable in The Gambia as well as other African countries with the Trypanosomiasis disease. Both the donor community and the GOTG should recognize the long-term potential benefits of this research for Africa. The high priority put on cattle and small ruminant research by the GARD/NARB report supports the continuation of this work. Continued financial support is recommended through AID/Washington and

other donors through the international research centers and FAO, and locally through the on-going GARD livestock component and DLS collaboration with the ITC village research effort.

ITC is well equipped with both basic and applied research facilities and personnel at the station and the village level in animal nutrition, epidemiology, breeding, genetics, herd management, and entomology. Special importance should continue to be given to study the cost/benefit ratio component of the epidemiology research at the village level. In support of the socio-economic studies, ITC has just employed a socio-economist to work with the epidemiology team. On-station research is also essential to support these village-level studies. As results from both the station and village research are proven cost-effective, DLS should be prepared to extend the new technology to the farmer/herders.

Because of the completeness of the ITC on cattle and the beginning research on small ruminants and equine species there should be little need for more than adaptive and promotional research from other government, NGO, and donor projects. Technology in poultry production can generally be gathered from networks or developed countries for applied or adaptive research and introductions in The Gambia.

All basic and most applied livestock research should be left for international financial ITC and other international centres to conduct. GOTA or donor support for national-level livestock research should be directed toward adaptation type applied research on interventions that have been proven to have a high potential for cost-effectiveness by the international centers. When mutually beneficial, DLS should cooperate with ITC in adaptation research at the village level to facilitate the introduction of promising interventions.

a. Epidemiology Studies

Production parameters have been collected on approximately 4,000 head of N'Dama cattle in village herds during the first three years to establish the baseline estimates of village herd production for subsequent comparison with interventions to increase production. Records include both health conditions (serology, parasitology, fly counts, and stress nutritional level) and production factors (reproduction, milk production, mortality and growth). In the past year, the introduction of low-level nutritional supplements, management practices, and internal parasite controls have been selectively applied to parts of the herds being observed. Promising results have been recorded from the improved production realized in the treated animals, but the cost/benefit analysis must be completed. The continuation of this work is essential for identifying cost-effective means of increasing output from the village herds.

Similar herds have been purchased and maintained on-station with high levels of supplementation and health care, in addition to a simulated village level management, to estimate the genetic potential of the N'Dama breed under near ideal conditions. Preliminary results of the first three years indicate that the genetic production potential for the N'Dama breed is much higher than the present environmental conditions allow given the low nutritional level and high disease stress. That is, the present genetic base can respond to a substantial improvement in animal nutrition and health.

b. Trypanotolerant Livestock Breeding Studies

The ITC is maintaining a total of approximately 2,000 head of cattle composed of a breeding herd of 650 to 700 cows; 200 young growing and replacement stock; and about 1,100 bulls and steers which were purchased under the recently terminated livestock development project for growing, fattening, and reselling to LMB. The breeding herd will be maintained and selected for trypanotolerance through use of production records and serological analyses. This breeding program is directed toward improving the N'Dama herd productivity for The Gambia and for export as live animals, semen, or embryos for transplant in the native cattle of the importing country.

Researchers will place emphasis on the station-developed selection methods and breeding stock to improve the village herds under the traditional management and stress. While it is hoped that management will also improve and that disease stresses will be reduced, the village environment will continue to be the best breeding sites to ensure that the breed maintains its trypanotolerance and that the farmer/herder benefits from this improvement.

c. Trypano/Nutrition Interaction Studies

Level of nutrition has been recognized more and more as a primary factor in disease resistance or tolerance in the developing world. Specific studies at ITC have shown that animals in both high and low trypanosomiasis stress conditions are less affected when they are on a higher level of nutrition. More research is planned to measure the economic benefits realized by this increased tolerance and to better understand some preliminary results showing that animals starting the test in the poorest condition performed best. This may be a form of compensatory gain/tolerance.

d. Tsetse Fly/Rainfall/Land Use Interaction Study

Entomology studies of the Gambian tsetse fly populations in different parts of the country have indicated a reduced number of flies from those reported in previous years

and, therefore, reduced stress of trypanosomiasis in livestock. This reduction has been related to the reduced average rainfall over the past 10 to 20 years and the associated increasing population and cultivation and clearing of bush fallow land. Further study is essential to quantify the effect of higher rainfall such as occurred last year and the long-term effect of the increasing cultivation.

It is speculated that the reduced tsetse fly population and trypanosomiasis stress has made possible the very rapid increase in the Gambian equine population over the past 10 years (over 300 percent). These donkeys and horses are essential for the ever-increasing draft power cultivation of the croplands, thus are deserving of attention regarding protecting them against a possible new buildup of the fly and trypanosomiasis when high rainfall years occur.

e. Small Ruminant Management Selection and Crossbreeding for Meat and Milk Production

Limited research has been conducted on small ruminants at ITC and only in collaboration with other institutions. Village-level veterinary care and vaccination for small ruminant rinderpest (PPR) has been provided by ITC through the veterinarian privatization effort as an incentive for cooperating farmer/herders. More recently the University of Edinburgh study of anthelmintic treatment, other disease prevalence, and measurement of production parameters of small ruminants has been initiated at the village level. This type of epidemiological research, including a strong socio-economic component, is essential for identifying cost-effective interventions that will be accepted by the farmer/herders.

In addition to the village-level small ruminant work, there is need for a station-level study to investigate the potential of the trypanotolerant goats for milk production. Both selection within the present breeds and cross breeding with exotic milk breeds might be tested to determine the potential of the local goats for improvement and to evaluate the introduced genetic material for ability to produce, survive and adapt to the local stresses. Only after successful testing at the station level would village-level introductions be recommended to further test the introduced breed adaptation. Sociological studies are needed to learn more about present milking of goats by some ethnic groups.

2. Adaptation Research

Much of the adaptation research will have been done by ITC because of the very effective village-level research program they are conducting. However, the DLS research division should continue working with livestock development projects as proposed

in their 1989 plan of work and monitoring interventions that are being introduced for evaluation of their adaptability. This research should be conducted much like the village herd surveillance of ITC, including both production parameters and added cost to estimate the cost/benefit ratio. Project management should be advised of findings and assisted in prioritizing future activities, eliminating non-beneficial technologies and selecting new prospects from ITC and/or other international or national research centers.

The following interventions have been prioritized using three different measures of value: monetary, human food energy, and human food protein. They are listed in order of their monetary rating, but the nutritional ratings can be seen along with the nutritional returns for nutrition expended in table 21 on the following page. Monetary expenses were converted to a nutrition equivalent using rice values to calculate the net nutritional returns. Five interventions were promising for promotion on a monetary basis, having a cost/benefit ratio of 1:3 or better. However, it should be noted that no intervention returned more than three-fourths of the energy expended and only two returned the protein expended. Therefore, even assuming the ideal of 100 percent research response to the interventions, the food nutrients would not be increased.

It has been well recorded in the literature on development efforts that livestock interventions have performed poorly. Because of the poor production results of less than 50 percent which farmer/herders have gotten from livestock technology in the past, only 50 percent of the research response was used to calculate the returns to each intervention. Prices will be based on present reports at the farm level that take into account the transport and marketing and distribution cost. The prices or value used for farm level interventions are: groundnut cake D1.10/kg, milk D2.4/kg. and calf liveweight D7.00/kg. No adjustment is made for any change in price due to changing supply and demand as affected by the intervention. Such price changes are probable given the limited supply of feed and domestic buying power.

a. Vaccination and Animal Health Care Delivery

There are only a few partial quantitative estimates of the benefits from a vaccination package, such as recommended by DLS: blackquarter, haemorrhagic septicaemia, and rinderpest, but it is generally accepted that these diseases, in combination with poor nutrition, cause the major deaths of the herds. A World Bank study of animal health service in sub-Saharan Africa by de Haan and Nissen (1985) reported a cost/benefit ratio of 1:8 for rinderpest and for hoof and mouth. He also reported internal rates of return of 12-53 percent for Brucellosis vaccinations. ITC has estimated that calf mortality

Table 21. Potential Livestock Interventions Listed by Priority for Each of the Three Factors: Monetary Return, Human Food Energy Return and Human Food Protein Return per Unit Cost of Each Factor

Annual Added Cost, Return and Ranking	Added Cost per Animal Treated	Added Return/An/Treat			Cost/Benefit Ratio	Added Dalasis Return/D100 Added Cost	Mone-tary Priority Rank	Added Food Energy/1000 kcal Ex Cost	Human Food Energy Priority Rank	Added Food Protein per 100 gm. Ex Cost	Human Food Protein Priority Rank
		Dalasis	Live Animal Weight Kg.	Milk or Eggs Kg.							
<b>Action Programs:</b>											
Animal Health/Nutr Delivery	105.40	521.78	54.00	55.48	4.95	495.05	High	238.73	Low	22.10	Low
Integrated Range/Forest Mgt	Stable	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Breeding N'Dama for Export	Reduced	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Privatize Mgt. C. Abattoir	Reduced	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Privatize Tannery	Reduced	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>Technical Interventions:</b>											
<b>Village Level:</b>											
Vaccination/An H Delivery	2.00	21.92	2.00	3.30	10.96	1096.00	High 1	719.14	Low 1	287.36	High 1
Weaned Calf Supplement	26.40	147.00	21.00	0.00	5.57	556.82	High 2	199.21	Low 5	25.81	Low 5
Small Rum Int Parasite/PPR	3.00	15.20	2.00	0.30	5.07	506.67	High 3	245.32	Low 4	144.91	Medium 2
Lactating Cow Supplement	71.50	326.60	29.00	51.50	4.57	456.78	Med. 4	304.48	Low 2	18.87	Low 6
V Poultry Feed Based NC Cont	2.50	11.06	0.50	0.18	4.42	442.40	Med. 5	246.31	Low 3	68.57	Low 3
Cattle Int Parasite Control	46.00	73.50	10.50	0.00	1.60	159.78	Low 6	69.68	Low 6	46.76	Low 4
<b>Commercial/Semi-Commercial:</b>											
Semi-C Tabaski Sheep Fatten	5.25	48.00	4.00	0.00	9.14	914.29	High 1	86.73	Low 3	11.24	Low 5
Commercial Broiler Productn	7.46	16.00	1.00	0.00	2.15	214.59	Low 2	112.20	Low 2	31.27	Low 2
Semi-Commercial Dairy	208.00	421.60	23.20	108.00	2.03	202.69	Low 3	455.12	Low 1	53.55	Low 1
Commercial Egg Production	145.92	147.80	1.80	7.00	1.01	101.29	Low 4	62.95	Low 4	17.50	Low 4
Comercial Bull Grow/Trade	552.00	529.20	58.80	0.00	0.96	95.87	Low 5	53.22	Low 5	23.07	Low 3

might be reduced from an average of 13 percent to an average low of 8 percent with annual blackquarter vaccinations. This gives a cost/benefit of more than 1:36. Averaging three available estimates a cost/benefit ratio of 1:15 will be used to evaluate the potential of this intervention.

The cost of three vaccinations and incidental care is estimated by DLS to be near D2.0 (or 2 kg of rice for nutritional comparison). Using the saving estimate from the ITC figures, an additional 5 calves per 100 cows and half the milk offtake of the 5 dams (they would have stopped lactating when the calf died) would be worth 4 kg. per cow in calf liveweight and 6.6 kg. per cow of extra milk.

b. Cattle Herd By-product Nutrient Supplement

Low-level supplemental feeding of both lactating cows and weaned calves by ITC has given impressive gains over the traditional village N'Dama herd production. However, the cost efficiency in both monetary and human nutrition terms has yet to be reported, since the socio-economist has only recently arrived.

(1) Feeding Weaned Bulls

Good production results were obtained by feeding post weaning bulls 200 gm. per day or a total of 24 kg. of sesame cake for four months during the wet and early dry season. The resulting gain in weight over the control group was 42 kilograms. More than half of this advantage is likely to be lost to compensatory gain in the next year unless the animal is sold at the end of the feeding period.

(2) Lactating Cow Supplementation

Cows fed one kilogram of groundnut cake three times each week for five months of the late dry season produced an additional 350 gm. of milk and the nursing calf gained an additional 80 gm. for each kilogram of cake she consumed. The supplemented cows also lost less weight, which resulted in better conception during the supplementation period than the control group (48 percent versus 9 percent).

This supplement of 65 kg. for the year produced an additional 23 kg. of milk, 5 kg. of calf liveweight from that lactation, and from the above conception rate, an estimated increase over the traditional calving rate of 50 percent to between 65 percent the next year. This average 30-percent increased reproduction should result in proportional increases in milk production of 80 kg. and calf liveweight of 24 kg. This is a total increase of 103 kg. of milk and 29 kg. of calf.

c. Small Ruminant Management, PPR Vaccination, and Internal Parasite Control

Village-level research is in the early stages in cooperation with ITC, but no results have been obtained for evaluation. The level of internal parasites generally reported in small ruminants in the developing countries suggests that increased production would be probable with an effective control. The UNDP project is also investigating management practices for small ruminants. Both of these interventions should get full research attention to determine their economic effectiveness before full introduction by DLS. Borrowing from the cattle parasite trials and benefits from bovine rinderpest vaccinations, it is estimated that a D3.0 investment in PPR vaccine and anthelmintic would return 4 kg. of small ruminant liveweight and 1.5 kg. of goat milk.

d. Village Poultry Feed-Based Disease Control

The new research on Newcastle disease control with a feed-based vaccine, which is being conducted by two Cornell DVM graduates in Basse, is very promising. Reports from Indonesia and Burkina Faso suggest that there may be a potential of doubling village-level poultry production with such a control. The cost of the minimal housing for night roost and the small amount of feed in which the vaccine is mixed is approximately D24.0 per dabada of 8 chickens or D3.0 per bird. Doubling the production would generate an additional 1 kg. of liveweight and 8 eggs per chicken.

e. Integrated Range/Forest Management

A unified policy on early burning, deferred grazing, and use of crop residues by the three departments involved (the Department of Livestock Services, the Department of Agriculture and the Department of Forestry) should increase the quantity and quality of natural forage available for livestock. The natural resource management recommendations should be as near as possible to the traditional system, which has outlived many efforts to replace it. Efforts to stop burning should be redirected toward getting the farmer/herder to burn early at a more opportune time and use the few small areas fenced by various projects for measuring the effects of deferred grazing and let the herder judge for himself. Flexibility to change as new evidence is gained from experience is essential, but all departments should be obligated to continue supporting the same system, which should result in minimal interference with the traditional system. A solution to this perceived problem has not and will not be found in isolation of the farmer/herder and his present practice.

This recommendation would not require additional manpower or expenses over the present efforts extended by the three concerned departments. The monitoring of the fence-deferred grazing sites and other selected areas should be continued by the DLS research division with the help of GARD. Likewise, no direct benefits will be estimated for this potential because it will be reflected in benefits reported for other interventions that depend on an adequate natural forage supply.

f. Cattle Management and Internal Parasite Control

One of the interventions showing promise in the ITC village-level research program is the control of internal parasites in cattle by more frequent movement of the correo (night bedding ground) and use of anthelmintic treatments. The movement of the correo at a frequency of just less than three weeks tended to reduce the worm larva concentration in the soil and the infection of animals. Tests are in process to measure the economic benefit of this minor management adjustment. Calves (16 to 24 months old), which were kept wormfree and larvaefree with monthly treatments of Ivermectin at 0.2 mg. per kg. of body weight gained an average of 402 gm. per day compared with 270 gm. per day for the untreated control group for 168 days of the rainy season. Unfortunately the results are not conclusive because there was wide variation in the individual gains. None the less, the researchers were encouraged by preliminary observations that indicated a continuing beneficial effect after the end of treatment, as demonstrated by higher gains for the treated group throughout the dry season. Unfortunately, these animals were replaced for the next trial so the long term effect of compensatory gain could not be measured.

The cost of this treatment was about D7.0 monthly treatment per animal or D46.0 for the 168 day rainy season. The benefit for the 168 days under treatment was 22 kg. and approximately 20 kg. for the dry season, totaling 42 kg. increased liveweight per animal per year. Past experience would suggest that much of that advantage would be lost to compensatory gain in the following years after this young age period of highest risk. Therefore, only 25 percent of the reported advantage was used in the priority calculations. These questions must be answered before a reliable cost/benefit analysis can be made of the intervention. If cost can be reduced by less frequent treatments and still maintain the substantial benefits in subsequent tests, the intervention could be recommended for future introduction by DLS. The MOA should await further results before introducing this technology.

### 3. Extension and Development

#### a. DLS Village-Level Animal Health and Nutritional Care Delivery

The Department of Livestock Services should provide, through the 43 DLS/Livestock Owner's Association post, farm level animal health and nutrition care delivery, including the vaccinations, anthelmintic treatments, and extension of other animal health and nutritional management practices (including provision of inputs), which have been or may be subsequently proven cost-effective for herd production increase by the epidemiological studies being conducted by ITC or others. This service should be paid for by the farmer/herders in the form of the head tax on all livestock and a slaughter fee now paid to the provincial government on the animals marketed, to be adjusted periodically depending on the services rendered, materials provided, and the number of animals being taxed and marketed. Indirect payment instead of direct privatization is considered prudent given the dependence of a preventative health program on broad coverage, which would not be expected under a private system due to both reluctance to pay directly and the shortage of participating private veterinarians and veterinarian assistants.

The dual benefits would be increased production efficiency and the potential for reducing or stabilizing the herd numbers while maintaining sufficient production to meet the community needs for milk, meat, eggs, draft, dung fertilizer, savings for cash and social obligations. As will be shown in subsequent calculations, the increased efficiency expected from this program would make it possible to produce the current output of animal producers with only 88 percent of the present herd.

The present DLS/LOA post housing and office facilities would be used in most cases, while some improvement may be necessary at some posts. The program should limit investments to those essentials such as storage space for feed and medication inputs and kerosene refrigerators for vaccine storage. Delivery of the goods from the source in Banjul to the posts should be contracted to private dealers who are regularly visiting the rural markets and hauling livestock and other products to Banjul. Special delivery of refrigerated vaccines for vaccination campaigns would be necessary. Most of the cost and post personnel exist in principle under the present mandate of DLS, therefore, the main added cost would be stocking the post with the health and nutrition inputs necessary to start the program and operate continuously until the tax returns could pay the stock replacement costs.

All farmer/herders should be informed that the service is not free and that the taxes they pay will reflect their payment for the inputs required for the improved technology.

The initial technology introductions should include only those that have proven the greatest potential for cost-effective production increases as estimated from available data and listed by priority in Table 21. Included initially are: cattle vaccination and health care delivery, nutritional supplementation of lactating cows, nutritional supplementation of weanling calves; internal parasite control and PPR vaccination of small ruminants; and Newcastle disease control in village poultry. Veterinarians and veterinarian assistants should be given an incentive payment based on the number of animals treated to encourage private aggressive action to promote the program.

Assuming an adoption rate of the interventions would be only 50 percent of the farmer/herders over a five-year period, due to logistics, communication, limited feed supply, reluctance of some herders, and other difficulties, which can slow adoption even when facilitated as much as this proposed program, the estimated national added inputs, costs, and potential return at the farmer/herder level are listed on the following page.

The resulting increase in animal protein equivalent production would be 13.6 percent over the current level with the same number of live-stock. (See table 22.) Or, because of this increased efficiency it would be possible to produce the present tonnage with a herd reduced to 88 percent of the present numbers. There can be a choice. There would also be a rewarding monetary profit for the farmer/herder as long as the feed and animal price ratio remains favorable.

b. Breeding N'Dama for Export

The GOTG should continue support of the trypano-tolerance breeding of N'Dama and small ruminants at ITC for the purpose of providing improved breeding stock and methods to improve the village herds, which must be the source of any sizable export orders. LMB should be discouraged from continuing and expanding present ranches, which would be in competition with the private farmer/herders and would be too small to meet the projected needs of FAO (Shaw and Hoste, 1987). The government should leave breeding and buying cattle and/or small ruminants to private dealers, while LMB or some other government unit might handle the international financial dealings and health requirements in collaboration with DLS.

This recommendation should reduce the operational cost burden of LMB and not require any new inputs from the government.

Annual Input Cost and Return

<u>Item</u>	<u>Quantity</u> 000	<u>Cost/Return</u> 000 Dal
Capital Inputs		
Refrigerators	43.0 units	344.0
Operation Cost		
Kerosene	5.2 lt.	15.5
Mobillette Fuel	10.4 lt.	31.0
Incentive @ D0.05/doses	7,299.0 doses	36.5
Refrigerator 10%/An/deprec	43.0 unit	34.0
Total Operation	NA	117.0
Added Inputs		
GrNut/Sesame Cake	2,160.3 kg.	2,376.3
Anthelminthics	172.5 doses	517.5
Vaccines		
BQ	51.7 doses	51.1
RP	315.0 doses	315.0
HS	51.7 doses	51.7
NC	139.0 doses	417.0
Total Add Input	NA	3,728.6
Grand Total Input	NA	3,845.6
Added Returns		
Carcass Beef	687.4 kg.	9,623.6
Mutton/Goat	172.5 kg.	3,105.0
Chicken Meat	52.0 kg.	821.0
Milk	1,554.1 kg.	3,729.7
Eggs	25.0 kg.	425.3
Total Add Return	2,491.0 kg.	17,704.6
Meat Equivalent	1,205.0 kg.	NA
Estimate Return for Labor	NA	13,859.0

Table 22. Energy, Protein and Dry Matter Estimates for Foods Produced in The Gambia

Food	As Harvested & Marketed			Price		
	Energy Kcal/Kg.	Protein Grams/kg.	Dry Matter Percent	Village	Urban	Imp/Exp
Rice	3030.0	72.0	90.0	1000.0	1000.0	
Maize	4000.0	115.0	90.0	1400.0	1400.0	
Millet	2618.0	73.6	90.0	1400.0	1400.0	
Sorghum	2975.0	80.0	90.0	1400.0	1400.0	
Groundnuts (Whole)	5700.0	243.0	95.0	1100.0	1100.0	1895.0
Groundnut Cake	4063.0	500.0	93.0	800.0	800.0	815.0
Sesame Cake	4063.0	500.0	93.0	500.0	500.0	
Rice Bran	2390.0	90.0	88.0	200.0	200.0	
Imported Mixed Feed	3500.0	210.0	90.0	3200.0	3200.0	3200.0
Imported Corn	4000.0	115.0	90.0	2300.0	2300.0	2300.0
Imported Protein Conc.				2400.0	2400.0	2400.0
Local Rice Bran	1200.0	45.0	90.0	200.0	200.0	
Cowpeas	3533.0	213.0	90.0			
Beans	3533.0	213.0	90.0			
Cassava	700.0	0.0	20.0			
Baobab Leaves (Fresh)	600.0	56.0	20.0			
Other Leaves (Fresh)	780.0	82.0	26.0			
Okra	288.0	20.0	15.0			
Tomatoes	220.0	11.4	15.0			
Egg Plant	190.0	10.0	15.0			
Mango	590.0	5.0	17.0			
Meat (Beef)	1850.0	295.0	37.0	14000.0	19000.0	
Meat (Mutton/Goat)	1850.0	295.0	37.0	16000.0	22000.0	
Milk	760.0	36.0	14.0	2400.0	5000.0	6900.0
Poultry (Meat)	1220.0	204.0	26.0	16000.0	21000.0	
Eggs (23/kg)	1200.0	200.0	30.0	17000.0	23000.0	17000.0
Fish	810.0	180.0	25.0			
Oil	9000.0	0.0	100.0			
Sugar	3750.0	0.0	95.0			

Note: Above values used for calculations in previous tables.  
 1 kcal = 0.004184 MJ; Average Energy Requirement = 1987 kcal/cap;  
 Average Protein Requirement = 51 gm/cap. (Averaged for all ages.)

c. Privatize Management of the Central Abattoir

The government should offer the central abattoir for contract management, rent, or sale to either private individuals or the butcher's association. Responsible departments should continue the required meat inspection service and sanitary slaughter supervision through DLS and LMB or other government enforcement. The private management should be free to expand the operation to include slaughter and storage of poultry, etc., if an economic need exists now or in the future. A feasibility study would be advisable before such an investment.

This will complete the privatization or semi-privatization of animal marketing with the exception of the hides and skins which will be discussed in the next item.

d. Tannery and Hides and Skins

The Belgian partnership tannery should be allowed to buy hides and skins domestically from private dealers who could combine the pick up and transport of hides and skins with the livestock hauling. LMB shares should be sold to local private investors if interest exists, or the GOTG could remain as an inactive shareholder. The completely private company should also be allowed to negotiate for imports of raw hides and skins to help increase needed efficiency of scale. LMB or another government unit should continue in the authority and control or monitoring of animal product imports and exports, with the support of the other GOTG agencies involved. This will further reduce the LMB personnel and operational budget.

e. Commercial Poultry/Animal Production/Provision of Meat, Milk, and Eggs

(1) Free Market Imports of Animal Products

The GOTG should allow continuous free market imports of animal products to facilitate the most economical supply of animal protein for the general population and the special needs of meat, eggs, and milk for the urban and tourist market when the domestic commercial poultry and animal producers can economically supply the needs due to high feed and production cost. Present import taxes on animal products being paid by the general consuming public should be studied and evaluated. A second option of retail taxes targeted at the tourists, expatriates, hotels, restaurants, and supermarkets, might be easier to collect. The expected effect on the GOTG budget would not change, as the new retail tax would replace the import tax.

(2) Free Market Imports of Feed Grains and Commercial Animal Production Inputs

The government should permit continuous free market imports of feed grains and other commercial animal production inputs to facilitate the most economical supply of animal protein for the general population and the special needs of meat, eggs, and milk for the urban and tourist market when world market prices are favorable for feed imports for cheaper domestic production of the animals. Caution should be taken to ensure that food grain and other direct human consumables take first priority for limited import facilities and personnel.

Because the poultry broiler or layer business can be initiated quickly, the farmers and commercial producers in the urban surroundings can intensify production to meet the urban and tourist demand when prices become favorable. This might include milk, mutton, goat, beef, and poultry.

The two previous recommended actions should give the commercial producers and/or provisioners clear options as to when to enter the production market to compete with their other option of provisioning the animal product needs through direct inputs. Both maximize profits for the commercial producer and provisioners and the cheapest sources of animal protein for the general public would be the expected results. Following are the options which will depend on the relative cost of feed inputs and price of animal product outputs listed in order of monetary priority (see table 21 for more detail):

- o Semi-commercial tabaski sheep fattening
- o Commercial broiler production
- o Semi-commercial dairying
- o Commercial egg production
- o Commercial bull growing/trading

D. Farm Level Diversification Programs and Projects

Gambian farmers combine land, labor, and capital to produce farm outputs for their own use and for sale. Almost all Gambian farmers sell some of the produce to purchase consumer goods or farm inputs such as seeds, fertilizer, and farm implements. This subsection will address programs and projects to make the farmers more productive.

1. Improved Seeds with a Higher Genetic Potential

Farmers will have improved cereal and legume seeds available through strengthened research and extension programs to increase their per hectare yields. Groundnut, sorghum, millet, maize, and rice seed of improved varieties are needed by farmers to increase yields. Farm-level management must

effectively combine these seeds with other factors of production (land and labor) to gain maximum yield. The improved research, improved multiplication of seeds by DAR and private farmers, and the improved DAS through better training and management must all be operational for the farmer to have the improved seeds available.

## 2. Simple Farm Management Extension Programs

Farmers will learn how improved practices or new crops will increase their income through an improved extension program. Extension efforts that address projects to increase production and farmer income are critical. Partial budgets, which project farmer income, will be useful in working with the farmer on changes in his farming operation. An extension program which fits Gambia's limited resources is a modified commodity approach. Extension services should develop training materials, simple bulletins, and simple, practical budget forms to instruct the field extension staff in teaching farm management to the farmer. In order that the farmer benefit from improved farm management, it is important that research and extension coordination be effective and budgeting be completed in a timely manner to make funds available for research and extension activities.

## 3. Improved Crop Husbandry

Farmers will learn to appreciate the value of improved crop husbandry through an improved extension service. The effective weeding of crops is often a major constraint to increased yield per hectare planted. One-fourth to one-third of the planted hectare is not harvested indicating that many crop fields are allowed to go to weeds. Certain simple cultural practices may contribute to better crop husbandry. Proponents of these programs report that rice yields can be doubled by planting in rows to facilitate weeding. Seed storage methods and basic simple farm management should also be emphasized. Field extension agents should be taught simple crop husbandry techniques through bi-monthly meetings. Field agents can then extend this knowledge to the farmers.

## 4. More Off-Farm Employment Opportunities for Farmers

Increased employment opportunity in the rural areas through increased investment in horticulture farms, should encourage private investors, foreign and Gambian, to invest in and establish vegetable and fruit farms. The government should encourage this investment through tax incentives and technical assistance.

Small farmers may find that work on vegetable farms will mesh very well with rain fed agriculture. Most of the labor is required during the dry season, as these farms will be irrigated to meet the vegetable and fruit winter demand in Europe.

#### 5. Women Farmer Incomes

With assistance from an improved extension service women farmers will have an opportunity to earn more income through vegetable sales. Women vegetable farmers are in a position to meet the tourist hotel demand. Research on horticultural crops and an extension project to assist in the staggering of planting dates will meet demands and avoid gluts. Assistance to help womens' groups organize their marketing efforts should be provided.

#### 6. Crops In Demand

An improved extension system can advise farmers of opportunities for income enhancement by providing a variety of crops, particularly those with a strong demand. The GOTG should encourage increases in crop hectares where technology is available and the demand appears to be strong, i.e., maize and sesame seed. Very specific but simple packages should be developed for maize and sesame production. Partial budgets should be developed to determine profitability on individual farms. This improved extension system will depend upon effective coordination with research, effective training programs for field extension staff, and effective supervision and management of the field agents.

### E. Recommendations for Strengthening the Fisheries Sector

#### 1. General Development Recommendations

In an activity as complex as the fisheries, involving a mixture of interacting populations of animals and plants, a continuous series of decisions and judgements must be made that have technical, scientific, political, social, and economic implications. These decisions often have a direct and significant effect on the welfare of the people of the country, the amount and nutritional content of their food supply, the profits or losses of their business ventures, and their jobs.

These important decisions can only be made if certain kinds of information are available about the fish and their environment. This information can only be obtained by continuous, strictly controlled, orderly and precise measurement of certain variables through scientific research.

The Ministry of Water Resources, Fisheries and Forestry, and the Department of Fisheries must have the results of research to carry out their responsibilities with full effectiveness. This

responsibility is to make it possible for the nation to obtain the optimum amount of food, jobs, and income from the fishery resource, and to protect all the many components of that resource and the environment from degradation or destruction.

The Department of Fisheries does not have the capacity, the facilities, nor the trained manpower to carry out this responsibility, and its research program at the moment falls far short of satisfying the nation's needs.

It is therefore proposed that assistance be given to The Gambia to build a research capacity in fisheries science appropriate to the country's needs. This should be started modestly, and built up as needs and resources allow.

This will require the design of a national fisheries research program. It should be emphasized very strongly that this should not be a copy of some other nation's program; The Gambia's program must be built with strict attention to the urgent local problems to be solved, and strong realism about the ability of local people to carry it out. The emphasis should be placed on highly applied research, designed to help the industry to supply fish as food more efficiently, to help government decision makers devise regulations to prevent depletion of exploited stocks and to protect the natural environment. For example, the offshore fishery for sardinella would be assisted if it had available at the right times, sea surface temperature data, since the appearance of this species is controlled in part by surface water temperature, and continuous length-frequency measurements of some of the most important species are essential in interpreting population size changes that might require shifts in regulatory policy.

These and other applied programs would be an appropriate start for a Gambian research group; if the programs were carefully chosen and the research conducted, the results could be significant.

There are a great many other scientific programs that could, to one degree or another, be useful to the development and management of the Gambian fisheries. It is suggested that this country delay the more complex and theoretical aspects of population dynamics and other matters and become competent in the collection and manipulation of the necessary data. At first the assistance of scientists from other countries, already skilled in population dynamics, could be used on some mutually acceptable basis. Senegal in particular has a competent and active fisheries research program. Discussions should be carried out on the kinds of cooperation that could be developed involving the use of data collected by both countries.

It is important to note that the Gambian national fisheries research program suggested here does not start with the building of laboratories or the purchase of research vessels. The design of these facilities depends entirely on the kinds of research to be carried out, and only when the plan has been completed should laboratories and other research tools be designed and built

This important task of designing the fisheries research program should include creating the design; and seeking the advice of the fishermen, the industry, environmentalists, and others with a stake in the results. It would probably be wise to have the effort led by an expert from a country with a successful program.

## 2. Fisheries Training Recommendations

The orderly and expeditious development of the fisheries in The Gambia requires extensive training of personnel at several levels. These levels include people who would be engaged in complex aspects of fishery science, such as population dynamics, and racial or genetics studies. At another level, trained people are needed at various technical and scientific disciplines involving fishery biology (reproduction, growth, migration, diseases of fish). In support of these scientists a cadre of scientific technicians is required, in such fields as biology, bacteriology, chemistry, physics, and mathematics. Staff should be trained in the careful collection and presentation of data series.

It would be easy to make a list of people who should be trained for service in the Gambian fisheries, but two circumstances make construction of such a list difficult. One is the lack of money from whatever source to finance substantial amounts of training that would be required, and the other is the shortage of qualified people available to undergo the training. Gambians do not yet have a strong tradition of science and technology, nor a tradition recognizing the necessity of education for advancement in any field of endeavor. This has led not only to a shortage of qualified workers in science and science administration, but it is handicapping the activities of commercial enterprises in the fisheries and aquaculture fields.

## F. Recommendations for the Development of Commercial Agriculture and Agribusiness

### 1. Overall Approach

One of the basic strategies for agricultural diversification and stimulating a growing contribution of the agricultural sector to GDP and export earnings is to facilitate expansion of commercial agriculture targeted to export markets and to effective demand in domestic wholesale and tourist

markets. In keeping with the macroeconomic policies of the ERP, the following recommended interventions to implement the policies suggested in chapter VII toward this end include:

- o Promoting increased investment in commercial agriculture and agribusiness
- o Providing technical assistance in the areas of marketing and agribusiness for investors
- o Encouraging commercial/small holder linkages and post harvest technical assistance

## 2. Increased Investment

Intensified commercial agricultural production and increased net post-harvest value require substantial capital investments for buildings, machinery, equipment, and working capital. It is recommended that funds for these investments be sought from private sources, Gambian or foreign. This is necessary to avoid repeating the unsatisfactory performances experienced in the past when the strategies of extending soft loans to farmers or businessmen, and direct TOTG/donor investments in agricultural projects or parastatals, were tried in The Gambia.

The likely integrated marketing and production activities are horticultural crops, intensive livestock such as poultry, and animal feeds.

## 3. Technical Assistance

Technical assistance is the main intervention recommended to assist a more rapid increase in private investment in commercial agriculture and agribusiness. The intent is to assist currently active and prospective entrepreneurs by providing TA in the areas of markets and marketing, packing and processing, transportation, commercial practices, and sources of financing identification.

One fundamental aspect of the strategy is that prospective enterprisers need to have equity capital for investment. They also must be willing to accept the risks assumed with establishing a new enterprise. Other requirements are that they have management capability, technical know-how, access to markets and established credit. However, it is difficult, particularly for those currently resident in The Gambia, to acquire all the necessary information needed to establish new agricultural enterprises or to solve all production or marketing problems as they arise. The process of development can be increased if technical assistance is available for farmers and businessmen.

Since the investor is expected to be knowledgeable to begin with, the approach is not intended to be a "cookbook" type of assistance designed to create a "turnkey" operation for an inexperienced investor. Rather, it envisions assistance in two areas: specific local knowledge and information only available from sources outside The Gambia. For instance, the advisors could help to identify land that is suitable and may be available for lease. They should be able to obtain answers to technical questions from sources abroad or put investors in touch with market outlets.

Neither the DAR nor the DAS are equipped to provide this type of assistance on all technical issues at this time. Their limited number of qualified staff are primarily occupied with providing services to the large numbers of currently established farmers.

Many units of government relate to commercial farms and agribusinesses in The Gambia. Specifically, the National Investment Board, the MEPID Department of Industrial Development, the Ministry of Finance and Trade, and the MOA units DAR, DAS, and DOP need to interact with the private sector in the speed development of commercial agriculture and agribusiness.

#### 4. Number, Location and Functions of Advisors

Two long-term advisors are recommended: a specialist in integrated marketing and production enterprise for crops, and a specialist in integrated marketing and production enterprise for intensive livestock.

Given the need for involvement of at least six GOTG units and the emphasis in the strategy on leadership from the private sector, it is recommended that the advisors providing technical assistance be officed with an NGO. It is suggested they could be located at the chamber of commerce. They should work closely with associations of commercial agricultural producers. The advisors should, through education and experience, combine agricultural and food processing technology knowledge with marketing and business management. A good source of management assistance would be retired agribusiness or food industry executives.

The GOTG has developed an investment incentive package and a promotion program for commercial and industrial development generally. The team expects that the solution of transport and marketing problems will be the keys to establishing successful enterprises. The production activities are likely to concentrate on horticultural crops and intensive livestock, initially poultry. Therefore, the advisors should be selected with emphasis on their qualifications in applying technology to marketing and production in an industrial setting.

The program should be organized to draw on information from all available sources and for the advisors to act as catalysts in stimulating growth of commercial agriculture and agribusiness. They should compile data and information and prepare summaries for interested investors on subjects with wide applicability, e.g., investment profiles and pre-feasibility studies.

The advisors will need backup assistance including connections with research and industrial sources in public and private institutions. These links should be with institutions or firms located in areas where the crop mix is similar to that of The Gambia and the firms are engaged in activities similar to those contemplated here.

Since the team has concluded that the best opportunities for diversification are expansion of crops, especially vegetables and fruit for the fresh market, the first priority should be the crop marketing advisor. To illustrate the kind of technical assistance needed, a description of the assistance required for horticultural crops follows.

There should be long-term technical assistance relating to the wide range of potential horticultural crops for prospective entrepreneurs within and without The Gambia. The scope of this assistance would be wide. Therefore, a major activity would be directing farmers and businessmen to sources anywhere in the world. The scope of the assistance to promote horticultural enterprises, facilitate their establishment, and coordinate the exchange of information would generally cover the following:

- o Facilitate the exchange of technical information, informally by direct contacts, and work with associations of growers.
- o Assist in identifying suitable land and water resources.
- o Enhance food packing and processing technology.
- o Facilitate the coordination of air and sea transport, which is and probably will continue to be a constraint because of limitations on available space. It will be necessary to address the problem of lack of cargo space, if the industry is going to grow.
- o Assist in the development of arrangements for airport storage facilities.
- o Coordinate specialized input supplies.

## 5. Commercial and Small Holder Linkages

There should be a simultaneous development of both small and large growers. Small growers need access to the overseas market and technology through the large producers. Small producers can supply large growers with products that they can produce efficiently; while large growers can concentrate their efforts on producing crop products more efficiently.

It is suggested that the GOTG should encourage linkages between small fruit and vegetable producers and larger commercial horticultural farms by promoting interaction between them and with research and extension services and the NGOs. The orientation of the GARD project should be shifted to recognize the bi-sectoral approach (large-scale commercial-integrated and improvement of small holder productivity). In the next few years, Gambian agricultural specialists will probably learn more from the integrators than the integrators will be able to gain from the technical assistance provided by MOA. Nevertheless, the plan should be established, so that in future, Gambian research and extension services will be able to contribute significantly to commercial agricultural development.

## 6. Production and Post Harvest Technology

Services of an experienced individual are needed to assist commercial firms on a continuing basis (long-term) in identifying special problem areas and to help them request specialized technical assistance when needed. This TA should be knowledgeable regarding commercial horticultural farm operations.

There should be occasional (short-term) foreign expert technical assistance to commercial growers in the following special problem areas:

- o Quality control
- o Storage
- o More efficient crop production techniques
- o Use of pesticides and fertilizers
- o Pesticide residue regulations

This technical assistance should be provided by a specialist in horticulture within the framework of the GARD project. It is suggested that the advisor reorient activities so as to target both commercial and small-scale growers. The expertise of the GARD staff in sampling and social science research methodology should be used to conduct well focused marketing surveys.

Input suppliers are another source of technical assistance for Gambian agribusiness. For example, chemical or seed companies can provide guidance regarding seed varieties, kind and

rate of fertilizer applications, plant spacing, weed control, and other cultural practices.

#### 7. National Level Impact

An increased number of the vertically integrated commercial agricultural crop enterprises will greatly increase cash crop diversification. In the most promising subsector, there are more than 30 common and specialty horticultural crops that offer potential for commercialization with the market-driven approach suggested above. Expansion of commercial agriculture and agribusiness will be a major contributor toward the needed growth in GDP and foreign exchange earnings in the next few years.

#### 8. Farm Level Impact

There is a profitable investment potential in vertically organized commercial agricultural enterprises in The Gambia, which can increase farm income. The highest priority crops, horticultural crops, will increase employment because advanced technology is compatible with intensive use of labor. With the use of well water for irrigation, much of the labor required will be needed during the dry season when other farming activities are reduced. There will be employment opportunities for farm family members to earn additional cash income, especially those without access to land, implements, or draft power.

The transfer of technology via private efforts is likely to be cost-effective, in the areas where the farms are located, and where the rate of adoption of agronomic technology is accelerated. This strategy emphasizes near-term productivity increases more than widespread technological advances. While expectations are modest for the ratio of technical spinoff directly to the large number of smaller growers, the team thinks there will be a positive contribution to overall improvement in crop and animal husbandry and some opportunity for outgrower sales.

Some have objected to the status of the farm workers as wage employees in agribusinesses especially when these studies are conducted on a very large scale. The scale of enterprises foreseen for the Gambia are relatively modest in comparison with many in other African countries and the rest of the world. Moreover, there simply is not an alternative model for achieving near-term gains in agricultural production in The Gambia.

The export-oriented farm is a supplement to presently grown crops, coexisting with existing farming systems without unduly disrupting them. The priority horticultural crops farm will fit best alongside existing cropping systems, farm structures, and

land tenure systems. For these reasons, the vertically integrated horticultural crops farm envisioned in The Gambia will contribute to the welfare of the rural population as well as to increased foreign exchange earnings.

The further commercialization of field crops or livestock such as maize and cattle, for example, is more suited to currently active local farmers than to the vertical approach suggested above.

Many of the same market-oriented principles apply to other enterprises such as maize or cattle, though commercial development will necessarily evolve more slowly because these enterprises are components of existing farming and land tenure systems.

#### 9. Privatization of Fertilizer Distribution

A plan is needed to implement fully the policy recommended regarding fertilizer distribution. The plan would define in detail the steps toward achieving the goal of a fully privatized and well functioning fertilizer procurement and distribution system over the next 2 to 3 years. This is necessary to successfully overcome the serious problems of adjustment faced by industry in The Gambia. It is recommended that the study be performed by individuals thoroughly experienced in this type of work. Professionals currently or formerly associated with the IFDC would be in an excellent position to develop such a plan.

#### 10. Expansion of Re-export Trade

A regionally focused analysis of Gambian and neighboring government policies is necessary to provide the basis for designing tax, investment incentive, and regulatory policies for agricultural inputs such as fertilizer, machinery, and animal feed ingredients that would enable Gambian traders to expand the value and quantity of re-exports to neighboring countries. This will require short-term technical assistance in the following two stages: analysis of regional trade policies, and recommendations for The Gambia.

This would provide direct benefits in terms of employment and government revenue, and would increase the scale and efficiency of farm input procurement and distribution that would benefit farmers and be a stimulus for increased production.

#### 11. Production Data and Marketing Information

Implementation of an agricultural estimates program (the NASS) requires a trained, dedicated staff in order to produce valid estimates that are actually useful to development

of commercial agriculture and agribusiness. The GARD assistance in training and technical assistance for DOP should be continued. The GARD advisors, quite correctly, recognize that the greatest constraint is not sampling or using analytical techniques is in field work and data entry. Therefore, even more attention needs to be provided for training of lower-level staff and logistics support (gas, vehicles, and access to radio or telephone communications).

The program of market price collection and marketing information should be revitalized as planned by DOP and GARD.

A person with analytical potential should be identified for assignment to the DOP. This person should interpret data collected (situation analysis), identify data users needs, make projections, and provide outlook analysis for selected commodities with broad markets and multiple Gambian producers. The Gambian candidates for this position will be found among those individuals currently under long-term training outside the country. The best candidate for the advisory role would most likely be a senior agricultural economist with experience as a government staff economist. In the meantime, temporary long-term technical assistance should be provided by a consultant.

CHAPTER IX

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IMPACT OF RECOMMENDED DIVERSIFICATION POLICIES,  
PROGRAMS, AND PROJECTS ON GOTG BUDGET

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## CHAPTER IX

### IMPACT OF RECOMMENDED DIVERSIFICATION POLICIES, PROGRAMS, AND PROJECTS ON GOTG BUDGET

#### A. Introduction

The GOTG impact of the diversification policy and program recommendations on the GOTG budget is particularly important now because constraints on government spending are a fundamental part of the ERP. This was one of the factors considered throughout the course of the study. Upon completion of the review of past projects and the development of recommended future actions, the suggested programs and projects were assessed to determine the likely budgetary impact. The scope of the analysis was limited to the changes in expenditures or revenues that would directly affect the recurrent and capital budgets of the GOTG as a result of the suggested agricultural diversification activities.

#### B. Policy Impacts

In keeping with the general policy direction set by the economic recovery program, the recommendations emphasize the redirection of current activities in order to free GOTG resources for diversification activities. This means that the programs can be implemented primarily by shifting existing funds and transferring staff positions to fill the new positions needed to accelerate the process of agricultural diversification and productivity improvement. Consequently, only small changes will be required in the level of GOTG expenditures for professional staff and supporting services.

The total capital expenditures required for the development of the diversification of commercial agriculture will be large. The team found that insufficient labor rather than land was the limiting factor in the production of the major food and cash crops with the production technology currently used by most farmers in The Gambia. Relieving that constraint requires the substitution of capital for labor. Bringing more land under cultivation will not boost labor productivity without a change in technology. Both working capital (e.g., to finance fertilizer and animal medicines) and fixed capital (e.g., work animals, farm implements, etc.) are required for this purpose. More than two-thirds of the farmers in The Gambia are said to have access to animal traction technology and some fertilizer is used, but the levels of use are comparatively low. For example, according to the FAO, the use of fertilizer nutrients per hectare of arable land and land in permanent crops per hectare in The Gambia is about one-ninth the world average. Privatization of parastatal marketing institutions and the development of new production and

marketing enterprises to expand the local supply of commodities for the tourist market and to increase the net value of exports will also require considerable capital investment.

The diversification study team realizes that the ERP has been in place since 1985 and that plans have been developed for divestiture of government-owned enterprises. The team recommendations re-emphasized the importance of completing the process of divestiture to ensure success of the diversification strategy. This will prevent losses in these enterprises such as those that have been experienced in the past from ultimately being the responsibility of the general government budget.

In the context of ERP policy, the central strategy for action in agricultural development in The Gambia during the next decade and beyond is to look to private investors to supply the financial capital to underwrite the needed investments. The roles of government that will contribute to boosting agricultural production and increasing diversity under this policy are facilitation of investment, coordination within and between ministries, regulation, research, and extension services. It is most important that the more limited functions of government in relation to the diversification efforts are performed well in order to make the private sector investment strategy work. Public resources are needed to perform these roles well and can be provided without much increase in the gross expenditures of the GOTG. There should be further reductions in parastatal operating losses accruing to the government account. We have recommended an increase in fees as part of the diversification program. Indirectly, government revenues will increase because of the anticipated growth in productivity in the agricultural sector. Therefore, there will be little or no net impact on the GOTG budget in the near term and growth in revenues over time to compensate for the increases in expenditures needed to support the agricultural sector as productivity expands. As was pointed out near the beginning of this report, the needed growth in agricultural sector productivity is at least five percent annually just for economic growth in The Gambia to keep up with population growth and provide small (one percent annually) increases in the level of living.

The success of the agricultural diversification program recommended depends heavily upon improvements in GOTG staff capability. This objective is the main thrust of the technical assistance proposals made in the body of this report. The team's recommendations for long- and short-term technical assistance and for long- and short-term staff training are based on the assumption that these activities needed to be funded primarily by donors. Review of past projects found that one of the reasons for unsatisfactory performance in some projects was lack of follow-through to continue the activity after the donor support ceased. The GOTG needs to spend some of its own funds to support

these activities financially. This kind of involvement gives ownership of the projects to the GOTG and will help to avoid future project abandonment. Therefore, the team's evaluation of the budgetary impact assumed that GOTG funds will be used to support part of the proposed increase in the level of GOTG programs. This would apply particularly to the expenses connected with in-country training, research, extension, and investment promotion activities, animal medicine and supplementary animal feeding, and regulatory programs such as meat inspection and enforcement of rules for The Gambia's fisheries.

### C. Changes in Recurrent Budget

#### 1. Recommendations with no Direct Budgetary Impact

Recommendations have not been made any for increases in the Gambian professional staff, professional staff support, or external technical assistance for the following activities proposed in our recommendations:

##### a. Privatization Activities

- o Increase high-quality maize seed
- o Design marketing system for livestock
- o Privatize the cotton industry
- o Encourage free market imports for animal products, feed grains, and commercial animal production inputs
- o Privatize fertilizer import and distribution sectors
- o Facilitate more private investment in commercial agriculture and agribusiness

##### b. Research and Extension Activities

- o Promote maize production programs
- o Promote fertilizer availability throughout the year
- o Continue to support sesame production programs
- o Strengthen the growers associations
- o Continue on-farm trials
- o Promote the increase of rainfed rice production
- o Promote animal traction
- o Work with women farmers
- o Continue research efforts on rice
- o Unify integrated range, crop, and forest land program
- o Provide for the capital goods replacement, which should be emphasized in all projects
- o Search for new crops

- o Introduce and test a wider range of food and cash crops

2. Recommendations with Direct Budgetary Impact

a. Counterparts for Long Technical Assistance

- o Appropriate fisheries research
- o Promote and support the development of aquaculture
- o Plan details of fertilizer privatization
- o Facilitate agribusiness investment
- o Facilitate production and post horticulture production and marketing
- o Engage in plant introduction
- o Oversee the establishment of womens' credit unions
- o Disseminate agricultural estimates and market information

3. Fisheries Resources in the EEZ

Effective leadership in promoting international cooperation and controlling fishing in the EEZ will add costs to the GOTG budget. However, the revenues recovered by effective enforcement of existing rules and the rents received from revised evaluation of the fishery resource would far exceed the added costs.

4. Intensification of Existing Programs

a. Short-term Training in The Gambia

The recommended training for MOA field staff will cost about 40,000 dalasis annually for transport, meals and lodging for 440 extension staff and 50 to 60 other GOTG staff, including DAR staff. This should be paid by GOTG funds. These estimates are based on the assumption of bi-monthly training sessions for an average total of 15 days per year for each participant.

b. Animal Health and Nutrition Interventions

The cost estimates were developed in detail in the cost-benefit analysis presented in chapter VIII. The expenditures would be at the rate of 3.8 million dalasis per year for inputs after 5 years, assuming that an adoption rate of 50 percent would be reached by that time. The capital costs for the GOTG would amount to 344,000 dalasis per year and the operating costs are 117,000 dalasis per year. The recommendation provides for collection of a fee on the livestock marketed at the country's abattoirs to compensate the GOTG for part of these

costs. The delivery of the health and nutrition interventions would be organized by current staff of the DLS. No additional people would be required.

According to the cost benefit analysis mentioned above, the benefits would exceed the costs incurred by more than 13 million dalasis. This benefit would be received by the farmer/herders if the GOTG paid the entire cost. So the farmer/herders would be expected to pay for the cost of the inputs (medicines and supplementary feed). In the final analysis, the net impact on the GOTG budget is expected to be negligible.

c. Paper and Printing Costs for Extension Publications

The DAS budget for paper and other supplies to print extension reports for training of field staff and for use by farmers is very inadequate. Provision should be made to augment this budget substantially. This is necessary to support the agricultural diversification effort. The agricultural communications effort is vital for the linkage between research and action at the farm level and comparatively inexpensive in relation to the other costs of the programs, particularly the staff cost.

The capital budget to directly support the long-term technical assistance recommended is assumed to be provided by the donors furnishing the technical assistance. This includes vehicles, computers, communications gear, office supplies, tools, and lab equipment where indicated.

The team recognizes the importance of general purpose public expenditures for schools and roads and the investments needed for public utilities such as water supply, drainage, electricity, telecommunications, etc. The need for investment in this area is huge. The benefits are general, for all types of development and for the improvement of the environment for human beings. Therefore, analysis of these infrastructure requirements is considered beyond the scope of this agricultural diversification study effort.

D. Technical Assistance and Training

1. Technical Assistance

The team assumes that the technical assistance recommended will be provided by donors and the private sector, i.e., private sector actors not recently active in The Gambia except in a small way. The strategy for substantial new developments in commercial farming and agribusiness is heavily dependent upon specific technical assistance being provided by the enterprise

owners, by the external commercial input suppliers, or by the marketing agents.

## 2. Training

The suggested long-term training would be provided by donors. Short-term training outside of The Gambia would also be supported by donors. However, a substantial part of the in-country training expenses should be underwritten by the GOTG.

## E. Revenues

In addition to the slaughter fees discussed and team increases in fisheries rents, the team recommended meat inspection fees upon privatization of the abattoir. The main impact on government revenues will be indirect, resulting from the growth of the value of the agricultural GDP envisioned under the diversification programs and projects.

**ANNEX A**

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**ANALYSIS OF SOCIO-ECONOMIC AND TECHNOLOGICAL  
CONTEXT UNDER WHICH AGRONOMIC DIVERSIFICATION PROGRAMS  
ARE IMPLEMENTED**

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## ANNEX A

### ANALYSIS OF SOCIO-ECONOMIC AND TECHNOLOGICAL CONTEXT UNDER WHICH AGRONOMIC DIVERSIFICATION PROGRAMS ARE IMPLEMENTED

#### A. Horticulture (Fruits and Vegetables)

The socio-economic and technological context under which the horticultural diversification programs are implemented feature the following factors.

1. There is a profitable investment potential in vertically organized fruit and vegetable export. It is the biggest area to take off in recent years.
2. Fruit and vegetable production takes place on large commercial farms of five to 60 ha. for export and in small communal garden areas cultivated largely by women for local consumption.
3. Production and marketing data are extremely limited.
4. Vegetable production, estimated to be responsible for exports amounting to 500,000 D (1985-1986) and steadily growing (no figures are available for sales through local markets and for on-farm consumption), is economically significant at both the micro and macroeconomic levels.
5. A 1988 survey of 150 women gardeners showed that 60 percent had earned more than 1,000 D from the rainy season sale of green peppers alone. Earnings of 2,000 D were reported by 10 percent.
6. There is potential for cutflowers and ornamentals production, initially for the domestic urban market.
7. Investment opportunities exist in simultaneous, integrated development of primary and subsidiary enterprises. In such enterprises, by-products of primary production can provide inputs for a secondary production process whose by-products are inputs to a tertiary process.

For example, producing fresh fruits for export will result in a by-product of imperfect fruit as it is graded to guarantee the highest price. Imperfect fruit provides the input for a pulping or juicing operation. The resultant waste from these processes provides feed for livestock and poultry enterprises, producing milk, meat, eggs, hides, and skins which have additional market value.

8. The Gambia has an eight month dry season with four to five months of cool, sunny weather which is ideal for growing many high value horticultural crops for European markets.

9. Most vegetable gardeners use water from shallow wells. The more modern, high technology horticultural farms, however, rely on boreholes, tapping the deeper aquifers that flow towards the Gambia River. Some boreholes such as those feeding the Banjul/Serrekunda urban complex are over 30 years old and still functioning.

10. Gambian River Basin Commission studies indicate that 30,000 ha. could be irrigated by groundwater in The Gambia. Some impressive if uneconomical installation of using water from boreholes have been established in several villages by the Islamic Development Bank. However, commercial agriculture using simple techniques make much more smaller investment to secure their water supplies. These farms are labor intensive and highly profitable because they can supply Europe with vegetables from November to early May. London is only five hours away by commercial jet and some commercial farmers are laying plans for dedicated cargo flights.

11. The domestic marketing system for fruits and vegetables in The Gambia is characterized by: (a) short marketing channels, i.e., producer-consumer or producer-trader-consumer; (b) marketing centers confined, on the one hand, to small weekly village markets and, on the other, to urban daily markets in larger population centers; (c) low-volume transactions except possibly with hotels and restaurants; (d) few wholesalers; and, (e) considerable cross-border trade.

12. The traditional cultivation of fruits and vegetables produced by women throughout The Gambia has been improved through horticultural research in several significant ways. Cultural practices such as time of planting, raised bed cultivation, planting and mulching of fruit trees, watering, insect and disease control, and harvesting have been defined. Locally-adapted vegetable seed is available from outside sources, and seed selection and grafting is practiced in fruit production.

13. The Department of Agricultural Research has conducted trials pertaining to time of planting, variety and fertilizer for fruits and vegetables, and has identified recommended rates. A horticulture marketing study by the USAID-sponsored GARD Project defined factors of effecting supply and demand for major vegetable commodities.

14. On-farm testing is being done through the linkages between research/extension/NGOs and farmers. NGOs are very active in promoting vegetable and fruit production activities.

15. Constraints to horticultural production in The Gambia have been identified as follows:

- o Few storage facilities exist for vegetables and fruits at the village level.
- o There is an absence of modern storage facilities at the Yundum International Airport for international exports.
- o Traditional planting cycles are ill-suited to meet vegetable and fruit produce demands during the tourist season. Because of the seasonality of vegetable production, there are major surpluses of vegetables and fruits at harvest periods and major scarcities during the off-season, resulting in wide price fluctuations and a need for horticultural produce imports.
- o For the small grower, the quality of the produce is poor due to an absence of quality control, pest damage and ill-suited harvest techniques which greatly affect shelf life. Severe damage is inflicted on horticultural produce through poor handling, congestion and ill-equipped vehicular transport facilities.
- o Literacy of workers is a problem in commercial farms.
- o Production technology is not very efficient. Improper application of fertilizer, resulting in waste of an expensive input, has been observed in some commercial farms.
- o There is a lack of cargo space for horticultural produce for export.
- o The Department of Agricultural Services has indicated that there is little developed horticultural technology to extend to growers.

#### B. Millet

The socio-economic and technological context under which the millet diversification program are implemented include the following factors:

1. Millet is the most important cereal in The Gambia in terms of hectarage and production. It is the preferred cereal in local diets. Millet and sorghum to make up about 90 percent of the grain diet in rural areas and 30 percent in urban areas.

2. Millet is traditionally grown by men but women often assist in harvesting. Early millet is generally grown close to

the compound where it can be protected from birds and utilize nutrients deposited by tethered animals.

3. Millet is relatively resistant to drought and thus assures a stable source of household cereal year after year. Because early millet matures early in the season, it is one of the first cereals available to end the "hungry season."

4. Plantings for early millet have increased at an annual rate of 17.7 percent since the drought of 1984-1985. Average yields of early millet in 1987-1988 were 1,244 kg/ha.

5. Early millet matures in 60 to 95 days and is usually harvested in September.

6. Late millet matures somewhat later but is a consistent producer under variable climatic conditions. It requires less protection from birds and can thus be grown in distant fields. Average yields of late millet in 1987-1988 were 927 kg/ha.

7. Millet is presently grown under low soil fertility and marginal conditions either as a monocrop or intercropped with cereals, groundnuts, and cowpeas. It is used primarily for food where produced, and little enters the market.

8. Direct seeding without plowing is becoming a common farmer practice. The accompanying no-till groundnut/millet rotation has serious problems of declining soil fertility, erosion, and increasing pest problems. Long-term soil fertility maintenance through soil amendments and erosion control is crucial to sustaining the groundnut/millet system. The overall challenge is to stabilize groundnut/millet rotation and to make it more profitable through a search for millet varieties that will outperform local cultivars under existing conditions (low soil fertility, prevalence of insect pests and diseases) along with improved soil fertility and better management of pest problems (including the use of pest-tolerant varieties).

9. Various local varieties are grown. Variety trials have been conducted for some years but none of the introduced varieties have outyielded the locals under low soil fertility and marginal conditions.

10. Constraints to millet production have been identified as follows:

- o Poor soil fertility.
- o Insect pests and diseases.

- o Lack of suitable varieties that can outperform local cultivars when grown under the two constraints listed above.

### C. Rice

The socio-economic and technological context under which rice programs are implemented include the following factors:

1. Rice is the preferred cereal for consumption in both rural and urban areas and faces increasing demand.
2. The Gambia does not produce sufficient rice to meet domestic demand and must, as it has for many years, import it to meet demand. In 1988, Gambia imported 105,000 metric tons of rice including 16,000 metric tons of rice food aid. About 40 to 50 percent is re-exported to Senegal alone.
3. A high percentage of imported rice is low price broken rice. Gambians have developed methods of preparation that makes broken rice the preferred type for most Gambians. There is low demand for quality rice.
4. Rice imports are partially paid for by foreign exchange generated by the export of groundnuts; the rest by resale of commodities.
5. With the decline in groundnut productivity, production, and prices and the improved price trends of rice, the comparative advantage of producing groundnuts and buying imported rice has declined.
6. In this circumstance, The Gambia has shown an interest in developing the capability to produce rice using irrigation and high technology. Unfortunately, experience to date has not indicated that The Gambia can produce rice under such conditions at reasonable costs.
7. Irrigated rice schemes have changed the division of labor. Where irrigation is available, men have taken up cultivation while women continue to cultivate swamp and rainfed rice. The tasks of weeding and transplanting usually fall to the women.
8. Irrigated rice production is centered in MID and URD where approximately 2,400 ha. of irrigated land was developed between 1966 and 1988 with the assistance of donors.
9. Rainfed tributary valleys and the periphery of The Gambia river flood plain provide roughly 25 percent of the total

potential rice land. In western Gambia, they are the principal locations of rice production.

10. Current rainfed rice production, the responsibility of women, is characterized by low production per capita (averaging a 12 bag shortfall/dabada at D150/bag) and low returns to labor. The yield gap between traditional and improved management practices is in the order of 400 percent (from 1.5 to 6.0 tons paddy/ha.).

11. Rice currently offers very low returns on inputs, particularly labor: less than 3 D per man-day. Potentially, rice can offer returns to inputs comparable to groundnuts: 9 D per man-day.

12. Late transplanting and weeding of direct seeded rice are major causes of low yields. They occur because womens' labor becomes a bottlenecked at times of peak activity. Transplanting is delayed because land preparation does not begin until womens' upland crops are established and nurseries are made. It is also very slow: 120 man-days/ha. at an estimated cost of 750 D.

13. Weeding of direct seeded broadcast rice is late in part because of difficulties telling crop and weeds apart early in their cycles, and partially because weeding takes a long time, almost 200 man-days/ha. As a result, fields are often weeded once per season.

14. In the face of these constraints, fertilizer and high yielding varieties are unlikely to have much impact, despite their potential for adoption. In a 1988 recent survey, 35 percent of farmers adopted the improved rice variety Peking and 27 percent used urea fertilizer.

15. Animal traction offers solutions to labor constraints and is being promoted to farmers.

16. There is currently an interest in the development of tidal swamps, an under-utilized resource, with significant potential for development. Promoters indicate that investment in their improvement can be made at relatively low cost resulting in at least a doubling of production. Other rice ecologies do not offer the same opportunities as upland rice production is affected by the risk of drought; increasing production in mangrove swamps may be constrained by acidic soils; and pump-irrigated rice is expensive.

17. Research on rainfed rice has lead to the development of a package of technologies that result in rice yields approaching those of Jahaly Pacharr and give higher economic returns. The technologies include chisel plowing and superEco seeding; single

moldboard plowing and harrowing prior to transplanting; stiff-strawed, high-yielding 100-day varieties; a range of weed control strategies that include the donkey drawn occidental hoe on light textured soils and hand-pushed weeders under flooded conditions; and single moldboard plowing and the cultivation of sweet potato on residual moisture following rice.

18. Rice research is focused on four areas: environmental characterization of rainfed rice; animal traction; integrated use of animal and chemical weed control; and fertilizer use efficiency.

19. The major constraints are:

- o high cost of producing irrigated rice;
- o excessive soil salinity in the alluvial area in the western third of the country; and
- o labor constraints.

#### D. Maize

The socio-economic and technological context under which the agronomic diversification programs in maize operate include these factors.

1. Maize is a multi-purpose crop that matures in 90 to 100 days. It is easy to raise, provides relatively high returns, is easily stored, requires less labor to produce and to prepare for consumption, is nutritious, provides more versatile diets, and the stovers provides animal feed.

2. Maize matures prior to or simultaneously with early millet and is thus considered a "hungry season" crop. It is tended by both men and women.

3. Trends of increasing maize production are highlighted by a sharp increase during 1984-1985 to 1985-1986. Increases in both productivity and areas under cultivation were attributed primarily to the activities of the MOA/USAID Mixed Farming Project.

5. Yields of maize have continued to increase in the last three years despite generally unfavorable rainfall. In 1987-1988 the average yield was 1,160 kg/ha., though yields of up to 4,000 kg/ha. are common in trials.

6. Maize hectareage decreased from a high of 16,600 ha. in 1985-1986 to 11,100 ha. in 1986-1987. It showed an increase again in 1987-1988 (13,000 ha.) and 1988-1989 (13,600 ha.). Before the MFP project in 1980-1981 the hectareage planted to maize was 5,900 ha. The decrease in hectareage after the MFP

project was attributed to fertilizer supply problems. There was no MFP project to follow it through. However, GARD, was to do so by agreement.

7. Maize is grown on upland soils under rainfed conditions in monoculture or polyculture. MID and URD have the largest hectareage, though maize is produced on some scale in other divisions.

8. Maize research initiation is also a notable success story in The Gambia following the introduction of MFP funded by USAID. The development of good maize varieties (NCB, Jeka, Across 7434, Maka), coupled with an intensive promotion campaign, led to an increase of hectareage from 7,600 ha. in 1981-1982 to 16,600 ha. in 1985-1986. Adoption by farmers of improved varieties is known to be close to 100 percent.

9. The use of fertilizer and their incorporation into the ground represent an innovation for Gambian farmers. During the past ten years, agronomic research was undertaken at both the station and on-farm level (in cooperation with the FAO Fertilizer Program) to investigate response to fertilizer i.e., time and rate of application. As a result, the extension service was able to recommend fertilizer use on crops. Maize and rice have been beneficiaries. It was reported that at the FAO fertilizer distribution center in Bansang, MID, 90 percent of the fertilizer distributed was used for maize.

10. Constraints to maize production include:

- o the availability of fertilizer and seed dressing;  
and
- o labor shortages.

#### E. Sesame

The socio-economic and technological contexts under which the agronomic diversification program in sesame is implemented include the following.

1. Sesame has the potential to increase rural incomes, improve diets, raise agricultural production, boost foreign exchange earnings, and help diversify the base of the economy.

2. Women are the primary growers of sesame. With prices for sesame in the range of \$400 to \$900 a ton, the potential for increased income among rural women exists.

3. Sesame has low labor opportunity costs because it can be sown late in the rainy season after all other crops are maturing and can be harvested after them.

4. Sesame cake is used for livestock feed. Processed oilseed cake meal and other by-products could support the expansion of the livestock industry. Increasing the domestic output of beef, poultry, and eggs for sale to hotels would substitute for imports.

5. Other private sector investment opportunities in agribusiness and services include sesame processing and sale of oil, cake, seed, and nuts.

6. Farmer decisions to grow sesame depends on producer prices and on returns to labor.

7. Sesame yields have been low, averaging 450 kg/ha., but could be doubled.

8. Since its promotion by the CRS in 1983, sesame planting has increased from about 30 ha. to about 12,000 ha. in 1987-1988.

9. Research is being conducted on varieties, dates of planting, and plant population.

10. Marketing was once a constraint, but this year private traders started buying sesame from farmers. Current constraints cited by farmers are:

- o lack of farm implements (no harrows);
- o length of time for tractors to prepare fields (a two-week waiting period),
- o insufficient fertilizer supply;
- o credit.

#### F. Sorghum

The socio-economic and technological contexts under which agronomic diversification programs on sorghum are implemented include the following.

1. Early sorghum is not a particularly favored cereal. It matures at approximately the same time as maize and early millet so is considered a "hungry season" crop and is grown by some farmers for this reason.

2. Late sorghum has not been widely successful partly because of its susceptibility to drought.

3. Sorghum is grown as a food crop with other cereals, groundnuts, or cowpeas. It is grown as a food crop and little

enters the market. Total harvested area of sorghum in 1986-1987 was 8,740 ha. Average yield per ha. was 1,029 kg.

4. Sorghum usually has a minimum of inputs into its production but in trials has shown significant response to fertilizer.

5. Constraints include:

- o common pests (striga, stem borers, and birds);
- o low acceptability of new varieties due to quality and processing problems;
- o and severe losses from drought.

#### G. Cotton

The socio-economic and technological context under which agronomic diversification projects in cotton are implemented include the following.

1. It is technically and agronomically possible to grow cotton in The Gambia.

2. GOTG's first major attempt in the development of cotton was through through the assistance of the African Development Bank. It was designed to establish 4,000 ha. of cotton with expected yield of 1,000 kg/ha. This project failed to achieve its target.

3. The newly introduced cotton did not suffer from a lack of investment as the capital requirements were met by the adjustment of the producer price of cotton to allow for the cost of inputs.

4. Despite declining cotton productivity, the GOTG continued to invest in cotton as a viable supplementary cash crop. A second cotton project was negotiated in 1984-1985 with financing (21 million francs) from the Caisse Centrale de Cooperation Economique.

5. Though cotton is the second largest cash crop, it represents only a small fraction of cash cropped area. Since its initial introduction, total production and area planted have not met expectation.

6. On the social side, the cotton project had a disruptive effect as the level of participants was limited by the scale of the project. The most active participants were those who belonged to the largest, wealthiest, and highest caste compounds,

often because ownership of oxen was established as a criterion for participation (for ridging cotton fields or preparing land). The net effect was negative in that established inequalities of income were not changed, and existing inequalities were reinforced.

7. Cotton does not compete well for farmer resources. It requires high labor inputs per unit area and high capital investments. Yields under local conditions are generally quite low.

8. Farmer decisions to grow cotton depends on producer prices and on returns to labor.

9. Price is set by the GOTG. Farmers complain that the producer price is announced only after farmers have already planted the crop. Two years ago, the price of cotton was reported at D 1,800/ton. Last year, the price was raised to D 2,200/ton. Producer prices are set each year in an attempt to gradually bring them in line with world prices and to eliminate subsidies. Net income to the farmer was reported at approximately D 1,500/ha.

10. GPMB handles the provision of inputs and marketing. The GPMB is in trouble. It was not able to finance what it has to do. Some of the cotton ends up in Senegal.

11. Extension officials believe there is adequate cotton technology to extend to farmers. It was reported that the cotton project got the best staff because they offer better salaries.

12. The most important constraints to the cotton industry have been identified:

- o inappropriate pricing policy;
- o deficient input distribution system;
- o inadequate extension support services; and
- o limited availability of credit to procure appropriate farm equipment in the face of dwindling labor supply.

ANNEX B

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SIX WAYS TO INCREASE SUPPLIES OF FISH  
AND PROMOTE FOOD SECURITY IN THE GAMBIA

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## ANNEX B

### SIX WAYS TO INCREASE SUPPLIES OF FISH AND PROMOTE FOOD SECURITY IN THE GAMBIA

In the introduction to chapter IV, six ways are listed by which assistance programs could increase the supplies of fish and promote food security in The Gambia. For some of these, indications can be given of potential returns from assistance projects. Lack of data on the amount of fish landed and the values of categories make these estimates approximate, but they may serve to show what is possible.

1. Increases in production are possible for segments of Gambian fisheries that are underexploited. Two examples can be cited. First, the gillnet fishery in the upper river catches are limited by a shortage of canoes and gillnets. The Integrated Artisanal Fisheries Project has been able to increase the number of canoes at Kemoto from one (shared at that time by 16 fishermen) to 12 (used by 36 fishermen). It has raised the level of catch and standards of living in the village. This has had a noticeable effect on adjoining communities.

Secondly, more fish could be taken from the pelagic offshore stocks. These fish, principally sardinella, a small fish of the herring family, have a ready market in Ghana, and could be sold at a profit, yet for low prices in The Gambia. They spoil easily and must be handled quickly. According to the owner of a Gambian fishing company, sardinella can be produced and distributed at from D 0.25-0.50/kg. and sold for about D 1/kg. retail. The necessary system and infrastructure would include a small purse seine vessel (10 t capacity), an ice plant with a 5 ton/day capacity, two refrigerated trucks to transport the fresh fish to market, 50 to 60 insulated boxes (one for each village market), and local vendors. From 2,000 to 4,000 tons of fish--perhaps much more--might be made available to low-income Gambian consumers.

2. When fish populations are overexploited, the catch declines even in the face of progressively greater fishing effort (which results in greater unit costs of production). In The Gambia, there is strong evidence that demersal stocks of fish in the EEZ have been overfished. The resulting lost production can be recovered by rational management, which requires government intervention on the amount and kind of fishing. Management efforts must be preceded by biometrical and population dynamics research. Data do not exist to allow estimates to be made of the amount or value of amounts lost, but quantities may well be significant.

3. Fish populations being exploited at their maximum sustainable yield require constant vigilance to ensure that this continues. Maintaining this status quo is of great importance, and the fact that no increase in harvest may take place should not be interpreted to mean that a fully satisfactory state of affairs is not in place. Keeping a firm grasp on the "bird in the hand" of sustained maximum catch is as important as increasing production in other circumstances. Many, and perhaps most, stocks of fish in the Gambian artisanal fishery, and perhaps some in the industrial fishery, are at this sustained level. Human intervention is required to maintain this order.

4. Handling, distribution and retailing of fish in The Gambia have improved in recent years, principally under the guidance of the Department of Fisheries and some assistance projects. In many cases the methods are still primitive and inadequate to deliver wholesome fish to the consumer. This results in consumer resistance to fish, and in substantial losses of food and income through spoilage. It is estimated that as much as 30 percent of the fish caught in The Gambia is lost in this way. Investment in more and better extension to inform processors and others in the marketing chain of the necessity of using ice and other devices for maintaining the quality of their product could save thousands of tons of fish, whose capture and handling have already been paid for.

5. Without doubt, the greatest increase in supplies of fish--and the income that derives from them--to The Gambia, could come from the take-over by Gambians of the capture, processing, and marketing of fish from the offshore EEZ. At present the whole harvest from this rich area, and nearly all the income that flows from it, goes to foreigners. Most countries, including some of the big fishing nations like Canada, and the United States, have a policy of moving with the greatest deliberate speed to the situation where they can harvest and handle the entire catch from their offshore resources. This should also be a policy of The Gambia. Clearly this must be a long-term goal, preceded in all likelihood by a series of joint ventures with experienced fishing nation partners, and by other interim policies. Achieving control of fishing in the EEZ, and then working toward national use of the resource could result in the addition of millions of tons of fish for food and income.

Some concept of the value of this catch can be gained from the prices paid for various categories. According to a Gambian broker, trawl catches are sold in three markets: about 60 percent (threadfins, grunts, croakers, and spadefish) is sold in Africa at a rough average of \$400 per ton; about 30 percent (black grouper, red snapper, mullet, cuttlefish, squid, and lobster) goes to Europe at about \$800 per ton; and the remaining 10 percent (cuttlefish, octopus, squid, and shrimp) is sold in Japan, at about \$3,000 per ton.

6. A strong trend in fisheries is toward aquaculture, or fish farming. By this means the multiple problems associated with pursuing wild populations of fish are eliminated, and interventions familiar to generations of land farmers can be employed. At present about 10 percent of fishery products worldwide come from aquaculture operations, and the proportion promises to rise. In Africa, aquaculture has barely begun to have an impact on food production, even though all essential elements are present. The Gambia, in general behind even the rest of Africa in most aquaculture, has the first shrimp farm on the continent, and a bright future seems possible in this field. With appropriate planning and deliberately paced progress, The Gambia should be able to develop a series of productive and profitable farming systems for fish, oysters, shrimp, and other organisms. The returns in food and income could be extremely large. Government and donor programs will be vital to ensure that this opportunity is taken advantage of expeditiously.

ANNEX C

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COMPARATIVE ADVANTAGE OF THE UNITED STATES  
IN FISHERIES RESEARCH AND DEVELOPMENT

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## ANNEX C

### COMPARATIVE ADVANTAGE OF THE UNITED STATES IN FISHERIES RESEARCH AND DEVELOPMENT

The United States has a strong comparative advantage in fisheries and aquaculture research and development. It is among the world's top five nations in fish production. It has established high competence in many aspects of fisheries work in government and university laboratories, including the creation of a Sea Grant College system patterned on the highly effective Land Grant Colleges.

The comparative advantage of the United States includes competence in many areas of special interest to The Gambia for development of its fisheries and aquaculture. Our competence in some of these areas is unmatched by any other country.

In the fields of biometrics and population dynamics, American scientists were pioneers, in the 1930s, and they still occupy a preeminent position in the theory and practice of this activity. Strong centers include the University of Washington, the University of California at San Diego (Scripps Institution of Oceanography), Woods Hole, and laboratories of the National Marine Fisheries Service.

The United States has more experience and greater success than any other nation in devising and implementing effective and fair systems under which foreign nations may fish in its Exclusive Economic Zone. It has large stocks of economically valuable fish and invertebrates off its long coastline. Its policy is to make it possible for American fishermen to harvest as much of this resource as is economically possible, and to allow foreign vessels to fish for excess quantities, or to harvest species not of interest to our fleets. It does this under strict regulation, backed by tough and effective enforcement. It charges foreign vessels substantial fees and requires accurate and complete accounting of catches by species and levels of fishing effort. American observers are required to be present on foreign vessels. Violations can result in fines, seizure of vessels, cancellation of licences, and other penalties. The experience in the area of regulation resides in 13 regional Fishery Management Councils consisting mostly of local people, and in the Office of International Fisheries of the National Marine Fisheries Service (NMFS). Enforcement is by the U.S. Coast Guard, with the help of NMFS.

The United States has a number of good centers of fisheries research. These have scientists who are expert in many areas of interest to The Gambia, and in the art and science of devising

research programs. Advice in these areas is available in several state fisheries departments, including those of California, Washington, Maryland, Massachusetts. Experts are also available at the universities of Washington, California at San Diego, Texas A&M, Miami, and others.

The United States produces large quantities of cultured trout, salmon, catfish, oysters and crawfish, and smaller but significant quantities of other fishery products. American scientists are among the world leaders in technical aspects of aquaculture such as genetics, nutrition, and induced breeding. Some individuals and institutions have become highly expert in certain kinds of aquatic farming systems, including those species listed above, as well as systems to raise tilapia, shrimp, macrobrachium, and others. Work of this kind is centered in universities including Auburn, Hawaii, Rhode Island, Texas A&M, Oregon State, and others.

ANNEX D

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GOTG COMMENTS ON DRAFT REPORT

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ANNEX D

GOTG COMMENTS ON DRAFT REPORT

Permanent Secretary of Agriculture Debriefing  
on  
A Study of Agricultural Diversification in The Gambia

The Chemonics team presented a summary of its major policy issues and recommendations at a meeting on July 20, 1989 in the Ministry of Agriculture conference room.

In attendance were:

Amadou Taal	PS/MOA
Mustapha Darboe	DPS/MOA
Gibril Jallow	DAS/MOA
Omar Touray	Dir/DLS
S. K. Janneh	Dir/DAS
John S. Rowe	COP/GARD
Earl Gritton	Agron/GARD
Jimmie Stone	USAID/REP
Don Drga	USAID/ADO
Omar Jallow	USAID/Project Officer
William Litwiller	Chemonics/Wash.DC
C. P. Idyll	" "
Robert E. Olson	" "
James R. Dickey	" "
John Conje	" "

Comments follow:

The Permanent Secretary (PS): Recognized the huge task of the diversification study and in general agreed with the policy issues and recommendations. He noted that increasing the production of millet also fits into the government food security plan and that the government was encouraging the use of milling machines for millet grain.

He also noted that commercial horticulture should be encouraged and requested additional information on how to develop the private sector.

Team response: This is covered in chapter II, section C.6.

PS: Suggestions for increased maize production were welcomed and it was agreed that good seed was essential.

Team response: This is addressed in chapter II, section C.4.

PS: Increased sesame seed production is being promoted by DAR and DAS. The government is now in the process of privatizing the GPMB. The cotton mill could be privatized, however The Gambia is short of entrepreneurs with the necessary skills to manage these types of enterprises.

Team response: This is addressed in Chapter II, section C.5.

PS: He supports the women's credit union proposal, however credit unions for small groups are essential and should be for all farmers (men or women).

Team response: This is covered in chapter VII, section B. 9.

PS: The Gambia needs a commercially orientated livestock sector. Private marketing of livestock will assist in this development.

Team response: Privatization is discussed in chapter VII, sections C, 3. and C.4. and in chapter VIII, sections C.3.c-e.

PS: The National Investment Board has established a one-stop service whereby investors can get a variety of information on investing in The Gambia.

USAID/Rep response: This is general investment information and investors should be provided specific information on opportunities.

PS: The ERP has made progress that could be lost if the agriculture sector does not perform better. He therefore requested a step-by-step, simple, action plan to serve as a guide to the GOTG in implementing the Chemonics' team suggestions. This plan should be prioritized and the timing of each step set forward.

Team response: This step-by-step action plan will be added to the report with the requested time schedule, summarizing the recommendations in table form (see annex E).

PS: "Mr. Taal favored the free imports of animal products, but was concerned for the protection of the general public from the dumping of contaminated animal products. The concern was not for the protection of the commercial producers who would be part of that free market."

Team response: The GOTG agency should continue to monitor quality, quantity, and sanitation control of imports (see chapter

VII, section C.4). The commercial producers will benefit from free imports when prices are favorable (see chapter VIII, section 3.e).

PS: Why is animal health and nutrition care delivery recommended as a government program instead of a private veterinarian service initiative?

Team response: Attempts to privatize the veterinarian service have not been widely accepted in other African countries nor in The Gambia by the farmer/herders. Because of the need for wide coverage of herds for an effective preventive program, it is considered prudent to impose an indirect pay program to ensure significant coverage, and payment by taxes, on the livestock.

PS: This diversification study was a requirement of an agreement with the World Bank and the IMF.

PS: Requested that points raised by MOA staff be included in the report. Their comments were as follows:

- o Cowpeas should be emphasized.

Team response: This crop, although considered, was given a secondary priority after discussion with DAR officials at the agronomic seminar on July 10, 1989.

- o Improved millet varieties are needed.

Team response: This is covered in chapter II, section C.7 and chapter VIII, section B.1.

- o Maize production should be emphasized.

Team response: This is covered in Chapter II, section C.4.

- o Post harvest losses should be addressed.

Team response: This topic is included in chapter VIII, section F.6.

- o New breeds and types of livestock should be investigated.

Team response: This type of research is a recommended activity at the international center level (see chapter III, section D.2.).

- o Pork production for export and tourists should be studied.

Team response: The production of pork for tourist markets will not have a high priority for The Gambia until the market

grows and a surplus of cereals exists. The Gambia is not likely to compete successfully with major pork producers in world markets.

- o Training programs are important but shortage of staff may limit them.

Team response: This is addressed in chapter VI. It is suggested that the MOA fill vacancies with and develop a hiring program for, bright high school graduates who can be better educated in the sciences at the Gambia College and abroad in agriculture.

PS: The government has many vacancies in the upper-level posts but lower-level posts (high school graduates) are filled. The problem of MOA staff leaving to join NGOs and the private sector is a problem. However, these people remain productive participants in the agriculture sector.

Team response: The development of MOA staff should be viewed as a long-term endeavor, of 10 to 12 years. It is suggested that each department develop a plan to upgrade their staff over time and as vacancies occur as noted above.

PS: Expand central abattoir under private management to include poultry slaughter and storage.

Team response: See expansion in chapter VIII, section C.3.c.

Dir/DLS: Farmer/herders will pay for some vaccinations such as PPR and Anthrax in times of outbreaks, but will not pay for general vaccinations and the care necessary for prevention or for a nutritional improvement intervention.

Team response: To realize the significant benefit return of 10 to 15 to 1 unit of cost, it will be necessary to have a large coverage of the herd with preventive vaccinations.

DIR/DLS: Other interventions should be considered to modernize the livestock industry, such as introduction of new milk breeds and exotic species, which may offer special production potential in trypano-free areas.

Team response: Such new interventions should be tried at ITC or other international livestock centres with the goal of recommending those that prove cost-effective for promotion by DLS in its extension program (see chapter VIII, section C.3.a).

DIR/DLS: Finding livestock officers with farm-level experience and knowledge for employment is difficult. There is a need for low-level training for veterinarian assistance at the village level.

DPS/DOA: Given the importance of the integration of crops and livestock, why is there not more discussion of this?

Team response: The integration and interdependence of crops and livestock is acknowledged. All village-level programs and interventions are built around and for that integrated system. One policy recommendation specifically addresses this subject in the "Unified integrated range, crop and forest land management" and is discussed in detail in chapter III (sections A.1 and 2, and D.2.b.1).

ANNEX E

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ACTION PLAN FOR IMPLEMENTING POLICIES AND RECOMMENDATIONS

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ANNEX E

ACTION PLAN FOR IMPLEMENTING POLICIES AND RECOMMENDATIONS

Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

H 1. Increase production of millet

- A. Develop improved varieties (6 years)
  - (1) DAR and GARD coordinate with IARCS year 1
  - (2) IARCS make crosses using Gambian cultivars as one parent year 1
  - (3) DAR screens segregating populations under Gambian conditions year 2 to year 3
  - (4) Link on-farm variety testing with soil fertility, intercropping, economic analysis; DAR coordinates activities with DAS/NGOs/farmers year 3 to year 6
- B. Improve soil fertility (continuing)
  - (1) Private fertilizer dealers and cooperatives make fertilizer available throughout the year annually
  - (2) DAS/FAO fertilizer program continues demonstrating advantages of fertilizers year 1 to year 3
  - (3) DAS promotes use of manure on millet fields along with other crop husbandry practices annually
- C. Reduce post-harvest losses
  - (1) DAS conducts "post harvest loss awareness" program year 1 & annually
- D. Develop "convenient" millet processing equipment
  - (1) MOA requests donor TA to do research for simple milling equipment year 1
  - (2) TA develops prototype of the equipment year 1
  - (3) MOA demonstrates equipment to farm families year 2
  - (4) Private sector imports or manufactures equipment as appropriate and sells to farm families year 2 & subsequently

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

H 2. Develop commercial horticulture

A. Short-term TA (6 weeks)

(1) MOA requests USAID to provide short-term TA (6 weeks) to study profiles of commercial horticulture firms and cooperatives of small holders year 1

(2) Short-term TA prepares scope of work for a long-term TA (see examples under "Recommended Programs in Fruits and Vegetables") year 1

B. Long-term TA (4 years)

(1) MOA requests USAID to provide long-term TA to assist commercial firms on a long-term basis year 1

(2) TA implements scope of work to assist in developing commercial horticulture in The Gambia year 1 to year 4

M 3. Continue to promote maize production programs

A. Produce high quality maize seed

(1) DAR/Seed unit produces high quality foundation seed for seed increase by private seed sector annually

(2) DAR/Seed unit supervises private seed sector in production of high quality maize seeds annually

(3) GOTG should reduce seed subsidies as quickly as possible year 3

(4) DAS should encourage farmers to select best looking maize plants and ears for planting the following year year 3

B. Strengthen maize extension efforts and promote fertilizer use and other input (seed dressing) throughout the year

(1) DAS, in cooperation with FAO fertilizer program, continues promoting fertilizer use and avail- annually for five years

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

- ability and other maize inputs throughout the year
- (2) Encourage the private sector in fertilizer distribution and availability throughout the year (see action plan under fertilizer privatization) year 1 & annually
- C. Maize-related implements (continuing)
- (1) Private sector to continue to manufacture and sell maize-related equipment annually
- D. Maintain a modest maize research program
- (1) DAR and GARD continue to conduct research on most pressing problems in maize annually
- M 4. Continue to support sesame production program
- A. Strengthen sesame growers association
- (1) CRS conducts management training program for the officers and employees of the growers association year 1 to year 3
- B. On-farm trials of confectionary types
- (1) DAR conducts on-farm trials year 1 to year 3
- H 5. Promote increased rainfed rice production
- A. Promote animal traction
- (1) MOA promotes animal traction in rainfed areas year 1
- B. Continue to develop management package for women farmers
- (1) DAR/DAS/NGOs promote management package to women farmers year 1 to year 3
- C. Continue research on rainfed rice
- (1) DAR continues research on cultural practices and fertilization of rainfed rice year 1 to year 3

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

- 
- D. Reduce post-harvest loss (continuing)
    - (1) DAS conducts post harvest loss awareness program and promotes recommendation to reduce losses year 1 to year 3
  
  - M 6. Introduce and test a wider range of food and cash crops
    - A. Designate a plant introduction section in DAR
      - (1) DAR designates a plant introduction coordinator year 1
      - (2) Plant introduction coordinator works with DAR/DAS/NGOs/commercial horticulture cooperatives to identify potential crops year 1
      - (3) Plant introduction coordinator brings propagating materials of identified potential crops year 2 to year 5
      - (4) Plant introduction coordinator tests adaptability of new crops year 5
    - B. Research on promising new crops
      - (1) Appropriate DAR programs, i.e., horticulture unit, upland cereals, etc., research on new promising crops year 3 to year 5
      - (2) MOA coordinates DAS/DAR/NGOs for on-farm trials of new promising crops year 4 to year 5
      - (3) MOA/NGOs promotes commercial exploitation of priority new crops year 5 to year 10
  
  - M 7. Privatize cotton industry
    - A. Encourage privatization of cotton industry
      - (1) GOTG provides tax incentives to encourage the private sector to process and market cotton year 1
      - (2) Negotiations to start prior to completion of present cotton project year 1

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

H 8. Form credit unions

- A. Write scope of work for credit union study and secure donor assistance year 1
- B. Credit union study completed year 1
- C. Negotiate TA program with donor and contractor; technical advisor(s) arrive and 8-year project begins year 1
- D. Training of prospective credit union officials and office managers begins year 2
- E. Organize 5 pilot credit unions; publish training materials; hold more training sessions year 2
- F. Organize credit union league to facilitate training procedures and material support efforts year 2
- G. Continue training, preparation of training materials, and assistance with management and accounting systems year 3 and year 4
- H. Form 5 more credit unions; complete all the training management and accounting control systems required year 5
- I. Continue assistance to credit unions; credit union league performs management and assistance with accounting to credit unions year 6 and year 7
- J. Form 10 more credit unions (total of 20); strengthen individual training and management programs year 8

9. Animal health and nutritional care delivery and meat inspection

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

- A. Animal health and nutrition care delivery
- (1) Budget funds for first year added cost (see chapter VIII, section C.3.a) month 1
  - (2) Direct divisional government to adjust head & slaughter tax to cover added DLS cost month 2
  - (3) Direct DLS to reinforce post personnel, arrange order and delivery of materials to posts month 3
  - (4) Direct DLS to implement proven interventions delivery month 6
    - (a) Cattle vaccination and health care delivery
    - (b) Weanling calf supplementation
    - (c) Small ruminant internal parasite and PPR control
    - (d) Lactating cow supplementation
    - (e) Village poultry feed-based Newcastle disease control
  - (5) DLS continue adaptation research for new cost-effective interventions annually
  - (6) Select new interventions from ITC and other international centers for local screening by DLS annually
  - (7) Pay incentives to field veterinarians and assistants monthly
  - (8) Renew vaccine & nutrition stock with funds from head and slaughter taxes monthly or as needed
- B. Meat inspection
- (1) DLS continues inspection at central abattoir to ensure sanitary conditions under private management month 1 or new management
  - (2) DLS continues inspection at other urban centers same as before
  - (3) DLS continues & expands inspection at village level over 5 year period
  - (4) DLS continues training of inspectors for all LOAs annually
  - (5) DLS supplies inspection for animal products imports month 1

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

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10. Unify integrated range, crop, and forest land management

- A. Common policy for all departments
  - (1) Mandate common policy be selected for Departments of Agriculture, Livestock, and Forestry month 1
  - (2) Initial policy would include early burning, deferred grazing and crop residue monitoring, not control, within the traditional system month 1
  
- B. Form research committee made up of one representative from each department
  - (1) Design and assign range/forest/crop monitoring/research task for each department, within present projects/ staff to establish cause and effect of traditional and introduced practices year 1 and annually
  - (2) Define and refine policy as data are collected/analyzed every 5 years
  - (3) Publish annual report of findings and activities of each department annually
  
- C. Contract technical advisor to advise all three departments on natural resource management/monitoring/research
  - (1) Serve as technical advisor to research committee year 1 thru 5
  - (2) Perform on-the-job training for field monitors in all departments continually
  - (3) Assist with monitoring, analysis and interpretation of technical and socio-economic data annually

11. Re-instate private marketing system for livestock

- A. Privatize management of the central abattoir
  - (1) Offer abattoir for contract management, sale or rent to private individuals or butchers' association month 1

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
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- (2) Maintain present slaughter and meat inspection requirement and provide inspection through DLS continually
  - (3) LBM or other GOTG agency collaborate with management and butchers to establish equitable slaughter/inspection fee that will ensure operation/maintenance, plus a fair return for management annual negotiation
  
  - B. Breeding/trading N'Dama for export
    - (1) LMB should return the "holding grounds" (ranches) to traditional farmer/herder users year 1
    - (2) Permit private traders to buy N'Dama breeding stock for export year 1
    - (3) Encourage ITC to continue N'Dama breeding program to provide improved breeding stock for farmer/herders continually
    - (4) Depend on traditional farmer/herder for source of export breeding stock continually
    - (5) LMB or another GOTG agency should handle international financial arrangements with foreign buyers continually
    - (6) DLS should continue health certification and vaccination control continually
  
  - C. Privatize the tannery
    - (1) Offer GOTG shares for private Gambian sale at advantageous price to permit repair/replacement of worn-out equipment month 1
    - (2) Discontinue LMB purchase of hides and skins month 1
    - (3) Permit Gamtan to purchase hides and skins domestically and internationally to optimize use of capacity continually
  
  - 12. Strengthen the free market imports of animal products, feed grains, and commercial animal production inputs to encourage the commercial livestock sector and provide more economical source of animal protein

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Priority	: 1. Policy Statements	:
	:	: Time
<u>1/</u>	: A. Recommendations	:
	:	: Period
	: (1) Action Steps	:

- A. Free market imports of animal products
  - (1) Facilitate the free importation of animal products continually
  - (2) DLS should provide sanitary, health control inspection, and monitor quality of imports continually
  
- B. Free market imports of feed grains and commercial animal production inputs
  - (1) Allow free imports of these inputs continually
  - (2) DLS should provide sanitary inspection continually
  
- H 13. Reassessment of policy on control of the Exclusive Economic Zone (EEZ)
  - A. Regulations governing fishing in the EEZ
    - (1) With TA determine need for updating fish population and maximum sustainable yield (MSY) estimates 4-6 months
    - (2) If necessary make new estimates, with donor help and/or cooperation by nations sharing the resources 1-2 months
    - (3) With TA from MSY establish maximum level of fishing effort for each kind of vessel 6-8 months
    - (4) With TA establish rules to be attached to fishing licenses 6 months
    - (5) Provide Dept of Fisheries with trained personnel to carry out its functions for implementing the system; use expatriates only as long as necessary ongoing
  
  - B. Enforcement
    - (1) With TA devise effective system of observation and surveillance in the EEZ 6 months
    - (2) With TA devise a system of enforcement, including penalties; if possible, involve international cooperation 4 months
    - (3) Provide marine units with manpower, vessels, and other tools to carry out this task ongoing

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Priority	:	1. Policy Statements	:
	:		: Time
<u>1/</u>	:	A. Recommendations	:
	:		: Period
	:	(1) Action Steps	:

- (4) Establish a system of annual review of results of the enforcement program ongoing
  
- H 14. Support appropriate fisheries research
  - (1) With TA devise a research program that addresses the needs of the Fisheries Department to carry out its management responsibilities 8-10 months
  - (2) With TA devise a research program that addresses the needs of fishing and aquaculture industries 8-10 months
  - (3) Explore ways of cooperating with Senegal and other nations in research of common value
  - (4) With TA and donor help build and equip laboratory facilities and purchase boats
  - (5) Train and staff the research/extension unit; use expatriates only as long as necessary several years
  
- L 15. Support promotion of aquaculture
  - (1) With TA design a long-term plan for development of private sector aquaculture including incentives for private investment 6-8 months
  - (2) With TA develop a system for adaptive testing of culture technologies developed by R & D groups worldwide 6-8 months
  
- H 16. Encourage and facilitate commercial agriculture and agribusiness
  - A. Increase efforts to attract Gambian or foreign investments
    - (1) GOTG agencies continue to promote private investment ongoing
    - (2) with TA adopt aggressive mode in identifying potential investors, sources of credit, finding relevant information, facilitating new business establishment ongoing

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

- B. Acquire up-to date technology information worldwide
- (1) With TA access technical data and information using industry, governmental and supplier sources ongoing
  - (2) Facilitate local investors acquiring needed data ongoing
  - (3) Use retired executives for short-term TA ongoing
- C. Facilitate commodity trade associations
- (1) TA acts to facilitate establishment and operation of trade associations ongoing
  - (2) TA posted to assist horticultural crop marketing, posted at office of commercial producers and marketers association year 1 to year 5

- H 17. Use comparative advantage in vertically integrated fruit and vegetable production for export
- (1) With TA establish linkages with potential agents and buyers first in Europe, then worldwide year 1
  - (2) With TA and help of established enterprises, collect marketing data from major potential importers year 1 and ongoing
  - (3) With TA assess competition in Caribbean, Central America, and other African countries year 1 and ongoing
  - (4) With TA, DAR and industry contacts monitor status of potential new cultivars for The Gambia year 1 and ongoing

- H 18. Emphasize production and marketing, commercial horticulture
- (1) DAR, NGOs, DAS continue research and development activities for small-scale commercial horticultural production and marketing ongoing
  - (2) Major thrust on development of private sector expansion in vertically integrated enterprises and GOTG agencies; and TA facilitates year 1 to year 5

Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:
	:		:

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- H 19. Stimulate commercial agriculture and agribusiness enterprises
- A. NIB offers incentives to commercial agriculture in same package to integrated farmers as to other industry ongoing
  - B. GOTG allows vertically integrated enterprises same access to fertilizer, other inputs as other farmers
    - (1) GOTG should establish working group to review laws and regulations year 1
    - (2) Adopt changes to unify programs year 1
  - C. GOTG taxes vertically integrated enterprises same as other farmers
    - (1) GOTG should establish working group to review laws and regulations year 1
    - (2) Adopt changes to unify programs year 1
  - D. Training for private sector staff
    - (1) GOTG includes training for horticultural industry workers in training plans ongoing
- H 20. Privatize and improve the fertilizer distribution sector
- A. Promote effective demand at the farm level
    - (1) With donor support DAS informs farmers of benefits of fertilizer use annually
    - (2) DAS/DAR demonstrates results annually
    - (3) DOP with cooperation of DAS/DAR project area planted and estimated fertilizer demand annually
    - (4) MOA releases use projections and supply information to farmers and trade annually
  - B. Completely privatize internal distribution
    - (1) With donor support TA (e.g., IDFC) distribution plan 3 months
    - (2) Plan at next marketing season year 1

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Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(1) Action Steps	:

- (3) Number of private dealers increased substantially resulting in better service to farmers and competitive prices year 2 to year 3
- C. Privatize fertilizer importing
- (1) Specialty commercial growers import directly year 1 and annually
- (2) Pending cessation of fertilizer grants, GOTG requires dealers bid at least landed cost including port and warehouse handling charges year 1 and year 2
- M 21. The re-export trade should be emphasized to increase trade volume in farm inputs
- A. GOTG bases acceptable auction prices on world market border prices at Banjul (to be phased out) year 1
- B. GOTG sets farm input duties no higher than "revenue" level year 1 and continuing
- H 22. Collection and analysis of agricultural sector data should be continued and marketing information stressed
- A. Improve training, supervision of field support
- (1) Organize DOP to concentrate on 3 functions: agricultural estimates, marketing information, and agricultural sector economic analysis. year 1
- B. Continue and improve agricultural estimates (NASS)
- (1) DOP with GARD assistance implements established work plan year 1 and annually

Priority	:	1. Policy Statements	:
	:		: Time
<u>1/</u>	:	A. Recommendations	:
	:		: Period
	:	(1) Action Steps	:
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		(2) DOP with short-term TA assistance develops stratified sample plan to obtain production and marketing data on "diversification" crops, e.g., sesame, horticultural crops, eggs, and broilers	year 1
		(3) DOP with TA assistance examines scope and methods to identify opportunities to save funds for new data	year 1
		(4) DOP conducts revised survey	year 2 and annually
		C. Revitalize and focus marketing information reporting and dissemination to commercially important diversification commodities	
		(1) With TA assistance DOP establishes limited scope (commodities, places, prices, quantities)	year 1
		(2) Reestablish market news reporting covering commodities in season, groundnuts, horticultural crops, fish, maize	year 2 and seasonally
		(3) Conduct intensive training for supervisory and field staff	bi-monthly
		(4) Start long-term training for staff (see chapter VI and item 18 in plan)	year 1
		D. Strengthen situation analysis capability	
		(1) Obtain donor assistance for senior TA, agricultural economist with experience in similar activity	year 1 to year 5
		(2) Send Gambians for long-term training (see chapter VI)	year 1 to year 5
H 23.		Senior staff in MOA and MWRFF should receive additional education to perform diversification roles; need the benefit of on-the-job training; field staff need bimonthly training and supervision sessions	year 1

Priority	: 1. Policy Statements	:
	:	: Time
<u>1/</u>	: A. Recommendations	:
	:	: Period
	: (1) Action Steps	:

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- A. Each department director should develop a long-term plan to secure properly educated staff and plan to upgrade existing and new staff; they should plan for 10 to 12 years; on-the-job training plan year 1  
and  
annually
  - B. Senior-level MOA and MWRFF officials (PS) should develop administrative plans to hold vacancies at lower levels for high school graduates who can be trained at the Gambia College in science and outside The Gambia in agriculture year 1  
and  
annually
  - C. Plans for upgrading the entire staff should be reviewed annually at the P.S. level and adjustments made to ensure their success year 2  
to  
year 10
  - D. Develop a plan whereby the advisors can best be used to provide this job training; deputy PS coordinates year 1  
and  
annually
  - E. GOTG should develop an annual field training plan which should use senior staff of DAR, DAS, and DLS to prepare instructional materials and serve as instructors; deputy PS coordinates year 1  
and  
annually
  - F. GOTG should establish the budget for training efforts, which will include funds for instructional materials, bulletins, overnight allowances, and transportation year 1  
and  
annually
  - G. National and divisional staff should develop a plan of follow-up visits to observe field-staff work on farms year 1  
and  
annually
- H 24. The deputy permanent secretary should coordinate the research and extension activities

Priority	:	1. Policy Statements	:
	:		:
<u>1/</u>	:	A. Recommendations	:
	:		:
	:	(i) Action Steps	:
	:		:

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- A. Deputy permanent secretary should coordinate plans for field programs with DAR, DAS, and DLS monthly
  - B. Plan coordination should emphasize multi-discipline efforts, i.e., programs that might involve DAR, DLS, DAS, and DOP

1/ H=High priority  
M=Medium priority  
L=Low priority

ANNEX F

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PERSONS CONTACTED BY  
THE GAMBIA AGRICULTURAL DIVERSIFICATION STUDY TEAM  
DURING THE PERIOD MAY 25 - JULY 26, 1989

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ANNEX F

PERSONS CONTACTED BY THE GAMBIA AGRICULTURAL DIVERSIFICATION  
STUDY TEAM DURING THE PERIOD MAY 25--JULY 26, 1989

NAME	POSITION/ORGANIZATION
Antrac Instructor	ANTRAC Training Center, Nere Kereman Farafenn
Bamba Banja	Fisheries Field Assistant, DOF, Kemoto
K.M. Banja	Deputy Manager, Jahally-Paccharr Project
Abass A. Barrow	Sales/Tech Manager, Central Abbattoir, LMB
Edward O Bayagbona	FAO Representative in The Gambia
Musa Bojang	Research Officer, Grain Legumes/Oilseed
Janko Bojang	Fisheries Inspector, DOF, Gunjur
Ian Bryceson	ScanGambia Company
Fatou Banja Camara	Coordinator, STC, Kerewan
Mamodou Canteh	Faroto Horticulture Farm
John H. Carlin	Manager, Atlantic Hotel
Mamady Ceesay	Private Livestock Intermediary, MID (N)
Alhagie Babou Ceesay	President, Gambian Maize Growers Association
Kotu Cham	Department of Fisheries
Derek Clifford	Animal Production Officer, ITC
Baboucarr Comma	Librarian, MOA Department of Planning
Seni Seku Dabo	Project Manager, Jahally-Pacharr Project
M. Dabo	Manager, Sapu Research Station
Mustapha Darboe	Deputy Permanent Secretary, MOA
Paul De Arman	Technical Advisor, SWMU
Philip DeCosse	Statistics Advisor, GARD
Mosfin Demise	WHO Representative
Ibrahim Diallo	RELO Officer, GARD
S.S. Dibba	Extension Agronomist, Jahally-Pacharr Project
Sambou Dibba	Production Manager, Gambia Marine Products, Ltd.
Patrick Dieraert	Extension Training Officer, French Cotton Project
Mamodou Drammeh	Production Manager, Gamtan Ltd.
Donald Drga	Agricultural Development Officer, USAID/Banjul
Willem Dullemond	Rooms Division Manager, Novotel Hotel
A.Dulsnrey	Farmer Draft Animal Trials, Mading
Ron H. Dwinger	Vet Scientist, Team Leader, ILCA/ILRAD/ITC
Frank Egi	Acting USAID Representative
Sandi Felby	UNDP Volunteer, Sheep/Goat Production Project
Allison Fennell	Veterinarian Student, Cornell/USA, Village Poultry Research Village
Major David Fisher	Gambia Marine Unit
G.O. Gaye	Station Manager, Horticulture, DAR

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Elon Gilbert	Economist, GARD
Earl Gritton	Agronomist, GARD
Groundnut Farmer	Planting with Donkey, Near Madina Koya
Groundnut Farmer	Planting with Oxen, Near Madina Koya
Charles F. Herd	Advisor, Gambia Chamber of Commerce
Tom Herlehy	Economist, USAID/Banjul
Frank Holbroke	Regional Division Office, DLS Poultry Study
Sarah Holder	Livestock Economist, ITC
Mark W. Holt	Associate Director, Peace Corps
Christian Hoste	FAO Regional Project on Trypanotolerant
Jarra F. Jagne	Veterinarian Student, Cornell/DLS
	Village Poultry Research Village
Bintou Jaiteh	Community Develop. Assist., North Bank
	STC
Kebba Jaitheth	FAO Sales Advisor, Sebanur Distribution
	Center
Omar Jallow	Project Assistant (Agriculture), USAID/
	Banjul
Saidn M. Jallow	MID-S Agriculture Coordinator, DAS
S. K. Janneh	Director, DAS
Yusupha Jassey	Department of Fisheries, Bato Kunku
Musa Jawla	Fisheries Inspector, Dept. of
	Fisheries, Bansang
Njagga Jawo	Crop Production Officer, Jenoi RDC
Barbara Jensen	Training Officer, USAID/Banjul
Ken Johm	Acting Director, Department of Planning,
	MOA
Andrew Jones	Agronomist Economist, ODA, DAR
Charles Joof	Director, DAS
Cherno Joof	Director of Fisheries, MWRFF
Mamodou Kanteh	Phytopathologist, DAS
H. Kaufman	Helminthiasis Project, ITC, Bon Sang, Swiss
Glen Knapp	Catholic Relief Services
Sheriff Kolley	Asst. Ext. Training Officer, French Cotton
	Project
Koma B.M.S.	IPMU Document Center
B.M.S. Koma	Document Center, MOA Department of Planning
Keba Kora	Fertilizer Retailer, Bansang, MID
J. E. Kristensen	Technical Advisor, MOA-FAO Fertilizer Project
Philippe F.R. Leperre	Village Epidemiology, FFLRAD
Douglas A. Little	Vet Ruminant Nutrition Specialist, ILCA/ILRAD/
M. Makeh	Vet/ITC Bangsang
Baboucarr Manneh	Principal Agricultural Officer in Charge
L. Marinah	Extension, Jahally-Pacharr Project of the
	Agricultural Communications Unit
Alphu J. Marong	Rice Research Project Leader, DAR, Sapu
Saya Mboge	Village Chief, Dowbumkr (Sebarow)
Saja M'boge	Village Chief/Farmer/Lvsk/Dah/Sunku, Range
	Development Project, UNDP
Matty Mbye	President, MID Sesame Growers Association
Mike McLain	Budget and Accounts Advisor, GARD

Malcom McPherson	Advisor, Ministry of Finance and Trade
James Ndene	Plant Manager, Nat. Partnership Enterprise
Omar Ngallam	Mill Manager, Sinch Madkdo, CRS Sesame Project
Alieu Ngum	Permanent Secretary, MEPID
A. M. Njie	Managing Director, Lyefish Co. Ltd., Bakau
Alfusainy K. Njie	Permanent Secretary, MWRFF
Matarr Njie	DLS/Research
Operator/Mgr.	Village Sesame Mill
Vorasak Pakdee	World Bank/FAO Extension Advisor, DAS
Dick Parkin	Harbormaster
Mauricio Pieroni	Idronconsultant, Bakau
Jess Reed	Animal Nutrition Research, GARD
Tom Remington	Hort./Rice/ANTRAC Research GARD
John Rowe	Chief of Party, GARD
S. K. Sam	Manager, Sanyang Kutti's Enterprises Feed Mill
Famara Bulle Sanyang	Station Headquarters Manager, ITC
Amadou Sanneh	Managing Director, LMB
E.A.K. Sanneh	General Manager, Gamtan Ltd.
Isatou Semega-Sanneh	Head, Nutrition Unit, Medical Health Headquarters
J.S. Sanneh	Training Officer, RDC
Michael Santerre	Deputy General Manager, ScanGambia Company
Mr. Manga Sanyang	Industrial Development, MEPID
Rohit Sha	Managing Director, Radville Farms, Ltd.
David Sinyan	Fisheries Inspector, DOF, Tanji
William E. Snow	Entomologist, Tsetse Team Leader, ILCA/ILRAD
M. Sompou-Ceesay	Director of Agricultural Research, MOA
Jabel M. Sowe	Animal Nutrition, DLS
Jimmie Stone	USAID/Representative, Banjul
Amadou Taal	Permanent Secretary, Ministry of Agriculture
Solomon A Tamoh	Senior Fisheries Field Assistant, DOF, Kemoto
Jon Tanner	Nutritionist, ITC
A. Olu Taylor-Thomas	Plant Manager, Seagull Fisheries
Mr. Teeween	Manager, Poultry Farm
B. N. Touray	Director, ITC
Omar Touray	Acting Director, Dept. of Livestock Services
Katim S. Touray	Soil Physicist, CRSM, SKPV
Dirk Verhey Van Wyk	Food Service Manager, Senegambia Hotel
Fred Withans	Program Economist, USAID/Banjul
A. Womcers	Farato Horticultural Farm

ANNEX G

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## ANNEX G

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