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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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SYSTEMS APPROACH

Typology analysis of Agro-Industrial Systems
in Fourty Four African Countries
for Project YA/RAF/96/X24 ;
"Agro-related Industrial Development in Africa:
Capacity-Building and Competitiveness,
Based on Potential Comparative Advantages."

Alliance for Africa's Industrialization
Industrial Sector Surveys Team

AAI
IDDA II

UNIDO'S SYSTEMS APPROACH APPLIED TO THE ANALYSIS OF AGRO-INDUSTRIAL SYSTEMS IN FORTY FOUR AFRICAN COUNTRIES

PROJECT: AY/RAS/96/AF/24

Alliance for Africa's Industrialization
Draft Discussion Paper
April 16, 1997

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INTRODUCTION

In a previous report to UNIDO entitled "A Systems Approach to Analysing Agro-related Industrial development in Africa" dated October, 1996, a review of UNIDO's Systems Approach Methodology was made with the main purpose of assessing past experiences in applying it to agro-industrial systems in developing countries. The report also analysed the applicability of the approach to the UNIDO project "Agro-related Industrial development in Africa: Enhancing Capacity-building and Competitiveness Based on Potential Comparative Advantages"(YA/RAS/X24) currently being implemented by the UNIDO Industrial Surveys Team.

The report concluded that UNIDO's Systems Approach was applicable to project YA/RAS/96/X24 in two of its modalities:

1 Typology work leading to the identification of patterns and stages of development of agro-industrial systems prevailing in African

2 identification of the nature of assistance needed by different countries to promote agro-industrial development to contribute to improvements in food security, increase agricultural productivity or increase competitiveness of agro-industrial sub-sectors and promote the influx of capital into the agro-industrial systems of African countries[1].

3 Surveying and programming agro-industrial systems with an integrated approach in specific African countries pre-selected in 2.

Specific recommendations were made in the first report concerning the modality of the systems approach to be applied at the regional and at the country level. For instance, it was recommended to use type A method for surveying and programming agro-industrial systems that would contribute to the attainment of one of more of the above mentioned objectives in pre-selected countries. With respect to the method to be used to identify the countries and agro-industrial systems to be surveyed and programmed, a typology modality, previously used in Africa for selecting countries for rehabilitation in agro-industries was recommended with some modifications[2].

The present report describes the work undertaken following the latter recommendation, presents the typology results obtained and briefly illustrates their application to identify needs and type of assistance to be provided to groups of countries or to an individual country.

---

[1] Objectives set for a UNIDO Agro-industrial Development Programme . "A Programme Framework for Agro-related Industrial Development in Africa", Draft Discussion Paper prepared by the Industrial Survey Team, February 24,1997.

UNIDO, "Allocating Technical Assistance Resources Among African Countries for Rehabilitation of Agro-Food Industries", PDSU, PPD.197, April 30, 1991.

The results of the analysis of components of the agro-industrial system (AIS) in 44 countries and the grouping of countries according to their characteristics (included in Annex 2) represent a useful contribution to the identification of countries to be attended to in the second phase of the present project. Quantitative information on the AIS of the 44 countries subject to analysis during the present phase of the project can be found in the data bases constructed in the course of the work. The two sources of information will provide a useful starting point for the in-depth analysis of agro-industrial systems of specific African countries that is to be undertaken during the second phase of Project YA/RAS/96/X24).

Structure of the Report

Chapter I briefly describes the methodology used. Chapter II contains the typology results obtained. It identifies assistance needs to promote agro-industrial development as well as the type of assistance required by countries exhibiting different patterns and levels of development in their AIS. Chapter III illustrates with an example how to use the typology results to describe the agro-industrial system in a particular country, identifying main characteristics, constraints and suggesting suitable strategies for agro-industrial development. Chapter IV contains concluding remarks and recommendations on work to be carried out in the future.

Annex 1. to the report contains the list of variables used to characterise agro-industrial systems prevailing in 44 African countries. Annex 2. contains the results of the analysis of most of the components of the AIS system in the 44 countries. The countries are presented in groups resulting from the cluster analysis. The characteristics of a given country are those of the group to which the country belongs.

CHAPTER I. METHODOLOGY

The systems approach to industrial sector programming was developed at UNIDO in response to the widely perceived need for increased impact of technical assistance projects on industrial development of developing countries. Within this approach, technical assistance actions responding to constraints affecting the different components of a system are identified and programmed. The individual project approach is replaced by the programme approach.

An industrial system (eg. an agro-industrial system) is defined as a scheme in which resources, industrial components, consumption components, institutions and policies related to a given industrial activity interact in an integrated an interdependent manner. The implication of these characteristics is that the system should be developed as a whole rather than by components. The notion of development is replaced by the notion of integrated development. The viability of applying this approach depends on the feasibility of properly identifying the components of the system, linkages between components and their relationships.

The system approach can be applied to the analysis of agro-industries at two different levels; when applied to a large number of countries it leads to a typology of countries of the agro- industrial system

under analysis; it identifies the main characteristics of patterns of development prevailing in a given sample of countries and groups countries according to those patterns. At the individual country level, the systems approach leads to a country's integrated development programme for the agro- industrial system under analysis. An integrated development programme comprises a package of technical assistance and investment projects and policy advice. The programme should gradually eliminate constraints found in the agro-industrial system that at the time of the analysis were found to be delaying investments and growth.

Given the impossibility of applying the system approach to the analysis and programming of a given industrial system in an individual manner to all countries in a given geographical region in a short period of time, an alternative approach is to conduct typology analysis of the countries in that region in order to identify country groups sharing similar characteristics in the system under analysis. The typology work permits the selection of countries for specific technical assistance interventions and the design of group-specific strategies and actions to eliminate constraints present in the different country groups.

The typology work used in the past for selecting African countries for rehabilitation of agro-industries was used within the present study. A modified version of the Agro-industrial System (AIS) was used (presented in Figure 1.) and a more complete list of variables and indicators to characterise the system was selected. The statistical manpower available in the project team was applied to the construction of the country-specific data bases and to perform the statistical analysis required for the typology work. SAS programmes available in UNIDO's mainframe were used for the analysis.

Box 1 lists the different steps required for undertaking the typology analysis of agro-industrial systems that was carried out during the present work. A brief description of each step follows.

BASE DIAGRAM OF AGRO-INDUSTRIAL SYSTEMS (AIS)

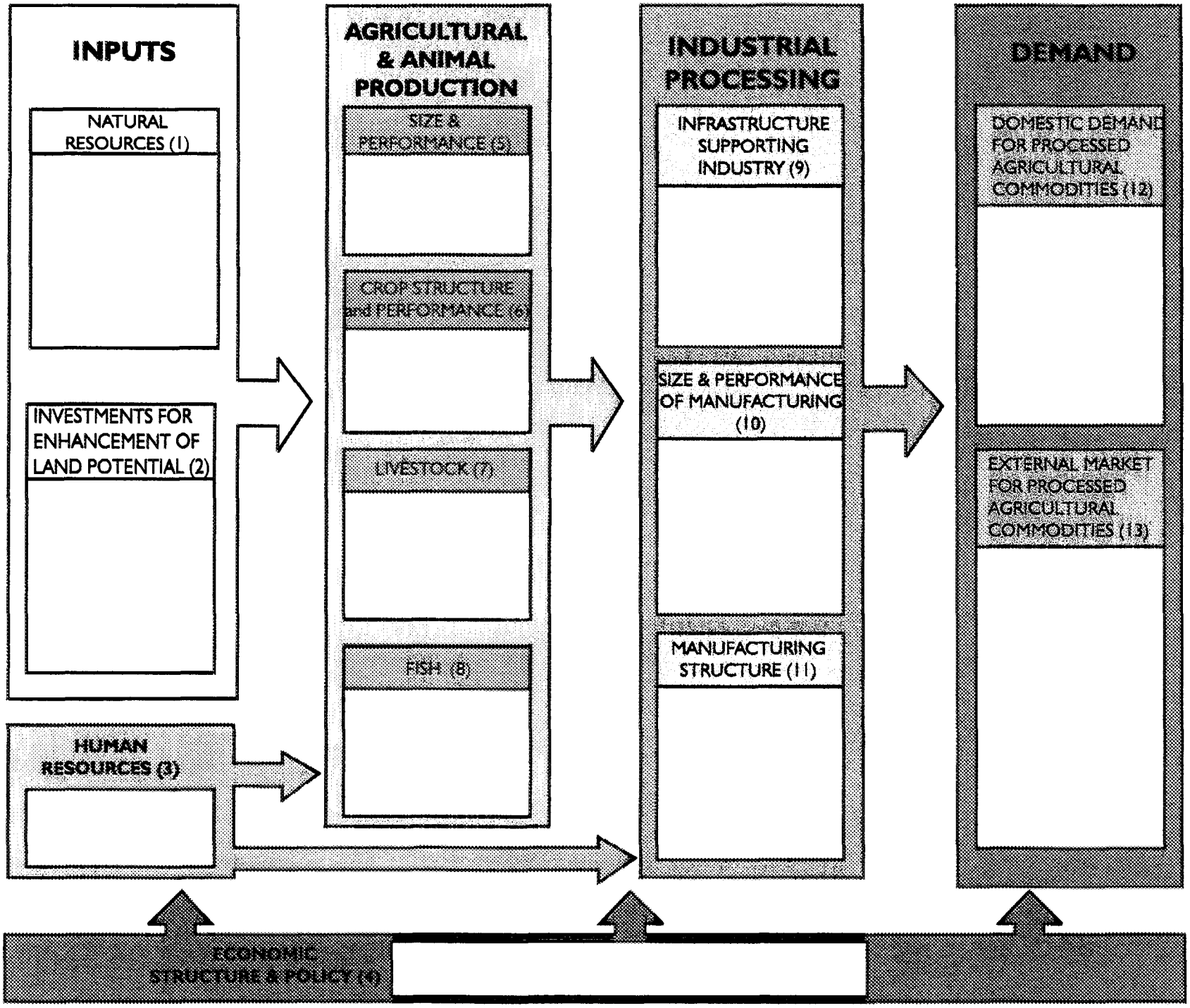

FIGURE 1

Box 1

Methodological Sequence Followed for the Typological Assessment of Agro-industrial Systems in 44 African Countries

1. Identify and select the components of the AIS to be analysed including forward and backward linkages whose interdependent relationships make the system operational.
Output: Base Diagram, as pictured in Figure 1.

2. Select variables and indicators to characterise each component of the system and linkages between them as indicated by Figure 1.
Output: List of variables and indicators (Annex 1).

3. Select dominant variables and indicators by using economic and technical criteria and results obtained from multiple correlation analysis performed on the regional sample.
Output: Dominant variables and indicators

4. Run cluster analysis with dominant variables and indicators and countries fully covered by them. Clustering analysis can be run for the whole system or for selected components. In the present study clustering was run for single and for composite components.
Output: Groups of countries with similar readings in the variables and indicators that characterise components.

5. Ranking of clusters and of the countries within, according to the characteristics of the different components of the AIS system.

6. Construct composite components ie. Pre-conditions for Agro-industrial Development, run cluster analysis and rank clusters and countries within as in 5.

7. Select indicator variables and rank countries according to their strengths in those variables. Juxtapose country scores obtained for composite components (ie. pre-conditions for agro-industrial development) to each indicator variable.
Output: Countries with the greatest need for assistance in the area of the indicator variable; countries to be attended in one or more areas characterised by the indicator variables.

1.The first step in the analysis deals with the identification of resource, production, industrialization, commercialization, demand and policy components common to all the agro-industrial systems (AIS) in Africa regardless of their processing specialization. A generic AIS system is pictured in Figure 1. The AIS components were chosen with a view to quantitatively describing, for each country, the technical and economic conditions which significantly influence the development of AIS.

2.The second step corresponds to the description of the components by a number of variables. The variables selected to describe each component are listed by AIS component in Table 1. Annex 1. contains a full description of the variables included in the analysis.

Table 1
Variables and Indicators Used for Characterizing the Different Components of the AIS System

No	Component	Variables, Indicators Used to Describe Components
1	Natural Resources	Availability of: land, water and forests.
2	Investments for Enhancing Land Potential	Irrigation, mechanization, fertilizers and pesticides.
3	Human Resources	Health indicators, illiteracy , enrolment and quality of education.
4	Economic Structure and Policy	Macroeconomic indicators, economic structure and the situation of the foreign sector.
5	Agricultural and Animal Production; Size and Performance	Agriculture in GDP, employment, and aggregated performance.
6	Crop Structure and performance	Major crops in countries, measures of productivity.
7	Livestock	Structure of production in different countries. Recent trends in livestock production. Availability of meat and leather for industrialization
8	Fish	Catches and catch growth [3]
9	Infrastructure supporting industry.	Availability of energy, infrastructure in transport and communications.

Information on fish resources with full coverage not available at the moment

No	Component	Variables, Indicators Used to Describe Components
10	Size and Performance	Relative importance of the manufacturing sector in the economy, recent trends in production and exports.
11	Industrial Structure	Relative importance of agro-industrial branches in specific countries, recent branch performance
12	Domestic Demand	Population, purchasing power and level of urbanization.
13	External Demand	Relative importance of exports to the economy and of manufacturing in exports. Competitive index in selected agro-industrial branches.

Indicator Variables. The indicator variables listed below were selected for the present analysis on the bases of the objectives approved for project Y/RAS/96/X24 during the project's Consultation Meeting, Vienna, February 24-25, 1997.

1. Food Security: Daily calories per capita..

2. Agricultural Productivity: Index of agricultural production.

3. Financial Flows: Foreign direct investment[4].

Cluster Analysis and Ranking of countries

In the process of selecting variables and collecting the corresponding information a country-specific data base was built. The assembled data was subject to statistical multivariate analysis as indicated below.

1.Cluster analysis (a multivariate statistical technique) was then performed on each component separately. Clustering allows the identification of groups of countries with similar readings on the variables of each component[5]. The notion of similarity between objects (the level at which the dendrogram is read) exists on a variable scale and changes according to the needs and circumstances of a particular research goal[6].

2.Ranking of countries according to their relative strengths in the different components of the AIS

No suitable single indicator has been found to measure agro-industrial competitiveness in all countries

Cluster analysis is a multi variate statistical technique for data review and analysis which permit the identification of similarities and dissimilarities between objects in a given data set(countries in the present case).

As in footnote 2

system. A description of each cluster's characteristics was completed before assigning scores. The ranking was done using a 1 to 8 scale. Scoring was based on the relative position of the cluster average with relation to the regional average. (A value equal or close to the average gets a score of 4). All countries in a given cluster will share the same score. The ranking reflects positive or negative attributes of each cluster and of the countries within, on the variables describing each component. Scores 1 and 2 indicate the presence of serious constraints in a given cluster and in the countries within.

3. Each group or cluster of countries identified during the analysis of each component of the AIS system was described. Descriptions are included in Annex 2.

4. A composite component was created to assess the relative strength of pre-conditions for agro-industrial development in a given country. The following were the components of the system selected to assess pre-conditions: (see Figure 1)

(1). Natural resources
(2). Investments for enhancement of land potential
(3). Human resources
(4a). Economic structure
(4b). Investment environment
(9). Infrastructure supportive of industry
(12). Domestic demand for processed commodities

The country groups obtained through clustering were also scaled in the manner described above and a ranking of countries was obtained according to the pre-conditions criteria. Groups of countries with similar readings on the pre-conditions criteria were the main output from this step.

During the next step the country scores on both the pre-conditions variable and each of the indicator variables were juxtaposed. The results obtained at this point indicate the urgency and type of assistance needed in one or several areas covered by the objectives of project YA/RAS/96/X24: **Food Security, Agricultural Productivity and Financial Flows.**

CHAPTER II RESULTS

2.1 Scoring Countries According to their Main Characteristics (Strengths and Weaknesses) in Single Components of the AIS System.

The results of clustering analysis and country scoring lead to the grouping and classification of countries according to the characteristics of their AIS system . Tables A-1 to A-13 in Annex 2. provide a rapid review of the main characteristics of the components of the AIS system for each one of the 44 countries included in the analysis.

2.2. Pre-conditions for Agro-industrial Development

Table 2 contains the final aggregated scoring results obtained in the pre-conditions for agro-industrial development prevailing in the 44 countries under analysis . Different patterns of pre-conditions are found in the region with descending scores from 8 to 1. The description of the country groups reflect positive and negative attributes that characterise each pattern.The highest score corresponds to the group of countries with the best pre-conditions for agro-industrial development. These countries appear at the top of Table 2.

Table 2

Pre-conditions for Agro-industrial Development in 44 African Countries[7]

Score	Group Description	Countries
8	Countries with the best pre-conditions in the African region. No major constraints in any of the components considered as pre-conditions were registered.	Algeria, Botswana, Morocco, South Africa, Tunisia.
7	High level of pre-conditions, similar to the previous group, but with low endowment in natural resources	Egypt, Lybia, Mauritius, Swaziland, Zimbabwe.
6	Countries with acceptable pre-conditions and very rich in natural resources; relatively well endowed in human resources.	Congo, Gabon, Namibia

[7] Pre-conditions for agro-industrial development: Natural Resources, Investments for Enhancing Land Potential, Economic structure, Investment Environment, Infrastructure Supporting Industry and Domestic Demand for Agro-industrial Products

Score	Group Description	Countries
4	Countries with good investment environment and good prospects of growth in internal demand , regionally acceptable industrial infrastructure and human resources (exceptions Cote d'Ivoire and Mauritania). Low levels of investment in enhancing land potential. Countries in this group have mixed levels in natural resources.	Cameroon, Cote d'Ivoire, Ghana, Kenya, Malawi, Mauritania, Nigeria, Tanzania.
4	A country with regionally acceptable industrial infrastructure and human resources, medium level in natural resources and acceptable investment environment. Main constraints are found in economic structure and potential growth of internal demand.	Madagascar
3	Countries well endowed in natural resources but with frequent major constraints in all other pre-conditions components	Angola, Central African Republic, Chad, Sudan, Togo, Zambia.
2	Acceptable investment environment and prospects for growth in internal demand. Low in natural resources and presently with serious constraints in human resources (Lesotho an exception) and in industrial infrastructure.	Benin, Burkina Faso, Ethiopia (incl. Eritrea), Gambia, Guinea, Lesotho, Mali, Niger, Senegal, Uganda.
1	Countries with characteristics similar to the previous two groups, but with negative conditions for investment and the poorest perspectives for growth of internal demand. With the exception of Burundi and Mozambique the group has acceptable ratings in human resources.	Burundi, Mozambique, Rwanda, Sierra Leone, Somalia, Zaire.

2.3 Identifying Needs and Type of Assistance Required to Attain Agro-industrial Growth.

The ranking of countries using the three indicator variables, provides a first assessment of the conditions of the country with respect to food security, agricultural productivity and attracting resource flows(in terms of foreign direct investment). A low score in the indicator variable is a reflection of a poor performance and the need for external assistance to attain the objective implicit in the indicator variable. A high score in the pre-conditions variable indicates that external assistance in terms of technical cooperation to promote agro-industries will probably produce quick results in attaining the stated objectives.
In other cases, low scores in pre-conditions indicate the need of a concerted effort to eliminate or attenuate critical constraints to investments in agro-industry before agro-industrial promotion can be undertaken.

The above implies that the two variables, pre-conditions for agro-industrial growth and the indicator variable should be viewed simultaneously when assessing the possibilities of attaining any of the three objectives (improving food security, improving agricultural productivity or increasing investment flows) through agro-industrial development.

The results obtained by juxtaposing country scores on the pre-conditions variable and country scores on each of the three selected indicator variables are contained in Tables 3, 4 and 5.

Table 3.

African countries ranked by increasing level of food security.

	Daily calory supply per capita (index North=100)	Preconditions score:
Somalia	48	1
Ethiopia (incl. Eritrea)	51	2
Central African Republic	54	3
Mozambique	54	1
Sierra Leone	54	1
Malawi	58	4
Rwanda	58	1
Angola	59	3
Namibia	62	6
Zambia	62	3
Burundi	62	1
Cameroon	63	4
Zimbabwe	64	7
Chad	64	3
United Rep. of Tanzania	65	4
Kenya	66	4
Zaire	66	1
Madagascar	68	4
Nigeria	68	4
Uganda	69	2
Sudan	70	3
Lesotho	70	2
Ghana	71	4
Togo	72	3
Niger	72	2
Senegal	72	2
Botswana	73	8
Mali	73	2
Congo	74	6
Swaziland	75	7
Burkina Faso	76	2
Guinea	76	2
Gabon	80	6
Cote d'Ivoire	80	4
Benin	81	2
Mauritius	86	7
Mauritania	86	4
South Africa	87	8
Algeria	93	8
Morocco	95	8
Tunisia	100	8
Egypt	100	7
Libyan Arab Jamahiriya	100	7
Gambia	n.a.	2

Human Development Report 1996.

Table 4.

African countries ranked according to increasing levels of agricultural productivity(*).1993-95

	Land productivity indicator	Preconditions score
Angola	38%	3
Niger	43%	2
Mozambique	51%	1
Mauritania	53%	4
Botswana	54%	8
Mali	57%	2
Somalia	59%	1
Senegal	62%	2
Tunisia	63%	8
Chad	66%	3
Gambia	72%	2
Sudan	75%	3
Algeria	82%	8
Central African Republi	88%	3
Zaire	89%	1
Burkina Faso	90%	2
Ghana	91%	4
Malawi	92%	4
Zimbabwe	92%	7
Sierra Leone	93%	1
Cote d'Ivoire	94%	4
Congo	95%	6
Benin	97%	2
Swaziland	97%	7
Cameroon	98%	4
Togo	101%	3
Libyan Arab Jamahiriya	101%	7
Namibia	103%	6
Rwanda	103%	1
Guinea	105%	2
Ethiopia (incl. Eritrea)	107%	2
Lesotho	108%	2
Morocco	109%	8
Zambia	113%	3
Kenya	114%	4
United Rep. of Tanzania	115%	4
Nigeria	117%	4
Uganda	117%	2
Burundi	119%	1
Gabon	122%	6
Madagascar	141%	4
South Africa	181%	8
Mauritius	272%	7
Egypt	425%	7

Note: This is an index of average yields per Ha. in cereals, roots and pulses. The African average is 100.

Source: FAO

Table5.

African countries ranked according to increasing levels of FDI over GNP in 1993-95.

	FDI/GNP	Preconditions score
Botswana	-2.23%	8
Gabon	-0.84%	6
Central African Republi	-0.09%	3
Sudan	0.00%	3
Zaire	0.01%	1
Senegal	0.02%	2
Algeria	0.03%	8
Burkina Faso	0.03%	2
Togo	0.05%	3
Niger	0.07%	2
Ethiopia (incl. Eritrea)	0.11%	2
Burundi	0.11%	1
Congo	0.11%	6
Uganda	0.13%	2
Malawi	0.13%	4
Somalia	0.13%	1
Kenya	0.13%	4
Rwanda	0.29%	1
Benin	0.36%	2
Guinea	0.58%	2
Mauritius	0.59%	7
Cote d'Ivoire	0.62%	4
Zimbabwe	0.68%	7
Madagascar	0.71%	4
Mali	0.73%	2
Mauritania	0.79%	4
Cameroon	1.04%	4
United Rep. of Tanzania	1.07%	4
Chad	1.08%	3
Lesotho	1.41%	2
Morocco	1.45%	8
Tunisia	1.49%	8
Zambia	1.87%	3
Egypt	2.17%	7
Mozambique	2.71%	1
Gambia	2.77%	2
Sierra Leone	3.28%	1
Angola	3.51%	3
Ghana	3.79%	4
Nigeria	4.74%	4
Swaziland	5.14%	7
Libyan Arab Jamahiriya	n.a	7
Namibia	n.a	6
South Africa	n.a	8

Source: World Investment Report.

2.4 Patterns of AIS Systems in the 44 African Countries

The tables that follow (6, 7 and 8) present groups of countries whose AIS system exhibit different patterns in pre-conditions for agro-industrial development and needs for assistance in areas related to food security, investment flows and productivity in agriculture . Patterns were identified using country scores and the following permutations:

High pre-conditions, High indicator variable
High pre-conditions, Low indicator variable
Low pre-conditions, Low indicator variable
Low pre-conditions, High indicator variable.

Table 6
Food Security Indicator variable: daily calorie supply per capita.

High Precondition./ High Calories	High Preconditions/ Low Calories	Low Preconditions./ Low Calories	Low Preconditions./ High Calories
Ghana	Malawi	Somalia	Togo
Botswana	Namibia	Ethiopia	Niger
Congo	Cameroon	Central Afr. Republic	Senegal
Swaziland	Zimbabwe	Mozambique	Mali
Gabon	Tanzania	Sierra Leone	Burkina Faso
Cote d'Ivoire	Kenya	Rwanda	Guinea
Mauritius	Madagascar	Angola	Benin
Mauritania	Nigeria	Zambia	
South Africa		Burundi	
Algeria		Chad	
Morocco		Zaire	
Tunisia		Uganda	
Egypt		Sudan	
Lybia		Lesotho	
No information on calories per capita is available for Gambia.			

Table 7

Investment Flows Indicator Variable: FDI/GNP

High Pre-conditions/High FDI/GNP	High Pre-conditions/ Low FDI/GNP	Low Pre-conditions/Low FDI/GNP	Low Pre-conditions/High FDI/GNP
Tunisia	Zimbabwe	Sudan	Lesotho
Cameroon	Mauritius	Togo	Zambia
Morocco	Madagascar	Senegal	Chad
Egypt	Cote d'Ivoire	Burundi	Gambia
Ghana	Mauritania	Zaire	Mozambique
Swaziland	Malawi	Burkina Faso	Angola
Nigeria	Kenya	Niger	Sierra Leone
Tanzania	Algeria	Ethiopia	
	Congo	Somalia	
	Botswana	Uganda	
	Gabon	Rwanda	
		Benin	
		Central African Republic	
		Mali	
		Guinea	

No information was available for South Africa, Lybia and Namibia on FDI/GNP.

Table 8
Agricultural productivity. Indicator variable: land productivity in main crops.

High precondition/ High productivity	High precondition/ Low productivity.	Low preconditions/ Low productivity	Low preconditions/ High productivity.
Lybia	Cameroon	Angola	Togo
Namibia	Swaziland	Niger	Rwanda
Morocco	Congo	Mozambique	Guinea
Kenya	Cote d'Ivoire	Mali	Ethiopia
Tanzania	Zimbabwe	Somalia	Lesotho
Nigeria	Malawi	Senegal	Zambia
Gabon	Ghana	Chad	Uganda
Madagascar	Algeria	Gambia	Burundi
South Africa	Tunisia	Sudan	
Mauritius	Botswana	Central African	
Egypt	Mauritania	Republic	
		Zaire	
		Burkina Faso	
		Sierra Leone	
		Benin	

2.5 Constraints Affecting Agro-industrial Development

A low score (1 or 2) in any of the components of AIS considered as pre-conditions for agro-industrial development is an indication of the existence of a serious constraint in the AIS . Table 9 lists, for each of the 44 countries under analysis, specific constraints that agro-industrial development across countries. This information provides an initial frame of reference for gauging the assistance to be provided to individual countries.

Table 9

Constraints Affecting Pre-conditions for Agro-industrial Development in 44 African Countries

Name	Natural Resources	Investments in Land Improvem..	Human Resources	Economic Structure	Investment Environ.	Industrial Infrastruc.
Algeria						
Botswana						
Morocco						
South Africa						
Tunisia						
Egypt	XX					
Lybia					X	
Mauritius	XX					
Swaziland	XX					
Zimbabwe	XX					
Angola		X	XX			
CAR		XX	XX	X		X
Chad		XX	XX	X		X
Sudan		XX			X	X
Togo		XX	XX	X		
Zambia		X				
Congo					XX	X
Gabon		X		X		
Namibia		X		X		
Benin		X	XX	X		X
Burkina Faso		X	XX	X		X
Ethiopia	X	X	XX	X		X

Name	Natural Resources	Investments in Land Improvem..	Human Resources	Economic Structure	Investment Environ.	Industrial Infrastruc.
Gambia	XX	X	XX			X
Guinea	XX	X	XX	X		X
Lesotho	XX	X				X
Mali	X	X	XX	X		X
Niger		X	XX	X		X
Senegal	XX	X	XX	X		X
Uganda		X	XX	X		X
Cameroon		XX		X		X
Cote d'Ivoire		X	XX			
Ghana		X		X		
Kenya	X	X				
Malawi	XX	XX		X		X
Mauritania	X	X	XX			
Nigeria	X	X		X		
Tanzania	X	XX		X		X
Burundi	XX	X	XX	X	X	X
Madagascar.		X		X		
Mozambique	X	X	XX	X	X	
Rwanda	XX	XX		X	X	X
Sierra Leone	XX	X			XX	X
Somalia	X	X		X	X	X
Zaire		X		X	X	

XX Acute constraint, score 1 in a scale of 1 to 8.
X Score 2 in a scale of 1 to 8.

Chapter III
AIS Country Description Using the Typology Results

In Chapter II the characteristics of the AIS were described along the components, across the 44 countries. In this chapter an example is given on how the same results can be applied to the study of the AIS system for a given country across the different components.

Cameroon was chosen as the example. Cameroon is a country that shows an acceptable level in the preconditions score together with a low value in the daily calorie intake and low agricultural yields. The above characteristics suggests that the provision of assistance to improve food security and agricultural productivity through agro-industrial development may meet with success. Information derived from the present typology shows the following characteristics prevailing in the country's agro-industrial system:

Per capita availability of cultivated area, and of water resources are high and forest resources are above the regional average. In spite of being an agricultural economy the contribution of agriculture to exports is small and agricultural productivity is low. A very low use of inputs to agriculture may explain the latter. The investment environment is average for the region but foreign direct investments are high.

Human resources indicators are slightly above the regional average. A high proportion of the country's labour force is employed in agriculture.

Cameroon is a medium-low producer of meat and an above average producer of leather. Fish catches are low.

The country has a poor infrastructure supporting industry, and a medium-sized manufacturing sector which is decreasing in importance within the African context. Within the manufacturing sector, the food industry is less important than in most African countries while the wood industry ranks high in its contribution to MVA.

The prospects for increasing domestic demand for agro-industrial products in Cameroon seem promising, it has an income per capita above average and it is highly urbanized.

The acceptable level of pre-conditions for agro-industrial development found in Cameroon, the regional-high levels of natural resources and the low use of inputs in agriculture indicate that there is scope for improving the country's agricultural productivity through industrialization. Low investment in agriculture and a poor industrial infrastructure constitute at present major constraints to agro-industrial development.

CHAPTER IV CONCLUDING REMARKS

This paper has briefly described the methodology of the systems approach and it has illustrated its application to the study agro-industries in a large number of countries. The results included in Chapter II and in Annex 2 constitute a comprehensive typology of the Agro-industrial system across 44 African countries. There are multiple ways of reading these results leading to several types of applications. Examples of three applications are provided in Chapters II and III: Identification of patterns of agro-industrial development using three different indicator variables; identification of major constraints affecting the AIS systems in the 44 countries and a first description of a country's AIS using Cameroon as a pilot country.

The results of the first two applications are being used to present a programme proposal to the Council of Ministers of Industry of African Countries during the coming month of May.

The information provided in the present report together with the data collected to develop this study should be considered valuable background material for future studies connected with project YA/RAS/96/X24.

Data bases on AIS have been constructed for all African countries for the present project.. It is however necessary to carry out additional work on the data bases in order to facilitate the periodical up-dating of indicators. Nonetheless, with the available data bases it is possible to undertake further work on the AIS system (not included under the present) study such as the following:

- Analysis of component 6 (crop structure and performance). Using data from FAO on production and land productivity, with an acceptable level of disaggregation, it will be possible to identify the countries that produce specific crops under the best conditions. The results of this work, would make it possible to infer in which countries or sub-regions, specific agro-industries have the best scope for development.

- Analysis of component 11 (Manufacturing structure): an analysis of the relative strengths and weaknesses and recent performance of specific agro-related branches.

The methodology used for the present study would also be applicable to assess the potential for further developing or introducing specific agro-industrial end products into a given AIS system. For any given product specific variables in each component could be selected, i.e. critical pre-conditions needed for its development , the crops or livestock upon which the final product is based, existing pre-conditions in the relevant manufacturing branch and its export performance.

ANNEXES

ANNEX 1

VARIABLES AND INDICATORS USED TO ANALYSE THE AIS SYSTEMS IN 44 AFRICAN COUNTRIES

Annex 1.

List of variables used to analyze the agro-industrial system.
Classified by components.

Component 1
Natural Resources

Variable	Units of measure	Sources
2 Fuelwood demand balance	Ranking score	19
8 Annual internal renewable water resources	m^3 per capita 1995	15, p. 306
12 Arable and permanent cropland	HA per capita, 1993	2, pp.3-6 ; 3
15 Grazing area	000's HA, 1993	(2) pp. 3-6
197 Forests	Ha/cap 1991-93	15 p.216

Component 2.
Investments for enhancement of land potential.

Variable	Units of measure	Sources
9 Irrigation	Percentage of arable land, 1993	2, p15
23 Pesticides imports/Total imports (US$)	Percentage 1994	11
20 Annual fertilizer consumption per cropland	Kg. per Ha.of cropland 1993	15, p 240
185 Tractors per arable land	Number per 1000Ha. 1994	7, pp3-6, 233

Component 3.
Human Resources.

Variable	Units of measure	Sources
30 Life expectancy at birth	Years. 1993	4, pp.135-137
31 Primary education: pupils teacher	Number, last avai. year	5, pp 3-94, 3-98

32 % of primary achievers	Percentage, last available. year	5, pp.3-139, 3-144
VARE Gross enrolment ratio at first and second level	Percentage 1993	5, I-2
34 % of females in secondary education	Percentage, last available. year	5, pp.3-155, 3-170
184 Adult illiteracy rate	Percentage 1995	5, p. I-2

Component 4a
Economic Structure.

Variable	Units of measure	sources
158 Agricultural share in total GDP	Percentage 1994	3
164 Share of total exports in GDP	Percentage. Last available year	3
165 Debt/export ratio	Percentage 1994	3
182 Ratio of FDI stock to GDP	Percentage 1994	14
VARC GDP per capita.	$US at ppp.1993	4 p.135
VARB Share of manufacturing in GDP	Percentage 1994	3

Component 4b
Investment Environment.

Variable	Units of measure	sources
165 Debt/export ratio	Percentage 1994	3
182 Ratio of FDI stock to GDP	Percentage 1994	14
192 Credit Risk	Rank Score	18

Component 5
Size and Performance of Agriculture.

Variable	Units of measure	Sources
158 Agricultural share in total GDP	Percentage 1994	3
183 Percentage of labour force in agriculture	Percentage 1990	17, pp.194-195

VARD Agricultural production index 1993-95	Index 1984-86=100	7
98 Annual average rate of growth in agricultural exports	Percentage 1984-1994 (index)	11

Component 6
Crop Structure and Performance.

Variable	**Units of measure**	**Sources**
... Annual production in selected crops	MT **1993-95**	7
... Growth of production in selected crops 1989-91 to 1993-95	**Percentage**	7
... Land productivity in selected crops	**Mt per Ha.1993-95**	7

Component 7
Livestock

Variable	Units of measure	Sources
... Annual leather and skins production	MT 1995	7
... Annual wool production.	MT 1995	7
... Annual meat production from indigenous animals	MT 1995	7
Livestock resources	Number (000's heads) 1994	
101 Cattle		2, p.189
102 Pigs		2, p.192
103 Sheep		2, p.192
104 Goats		2, p.192
105 Horses		2, p.187
106 Chickens		2, p.195
107 Asses	(in millions)	2, p.187

Component 8
Fish

Variable	Units of measure	Sources
... Annual catches	MT 1994	20

Component 9
Industrial infrastructure.

Variable	Units of measure	Sources
116 Installed electrical capacity	Kw/h per 1000 inhabitants 1994	1, pp. 364-371 3
121 Telephones in use.	Number per 100 people, last av. year	12

Component 10
Size and Performance of manufacturing sector.

Variable	Units of measure	Sources
122 Annual average growth in country share in MVA of total Africa.	Percentage-1994	3
126 Annual average growth of MVA share in GDP	Percentage 1984-94	3
149 Ratio of country share in manufacturing exports of the region	Percentage	3
VARB...manufacturing share in GDP	Percentage 1994	3
181 Share of manufacturing exports in total exports of each country	Percentage 1994	3

Component 11
Manufacturing structure.

Variable	Units of measure	Sources
123 Share of branches in total MVA for each country *Selected branches (*)*	Percentages 1984-1994	3
124 Annual average growth of branch shares in total MVA *Selected branches (*)*	Percentages 1984-94	3
127 Labour Productivity *Selected branches (*)*	Percentage 1984-94	3
174 Annual average growth of branch employment/total *Selected branches (*)*	Percentage 1984-1994	3

Component 12
Internal Demand

Variable	Units of measure	Sources
VARC GDP per capita.	$US at ppp. 1993	4
153 Urban population/ total population	Percentage 1993	4. pp 176-177
154 Access to safe water	Percentage of population 1990-1995	4, pp.144-145

Component 13
External demand.

Variable	Units of measure	Sources
164 Share of total exports in GDP	percentage 1994	3
181 Share of manufacturing exports in total exports	percentage 1994	3
150 Competitive index *Selected branches (*)*	Index 1984-1994	3

(*) Selected Branches :
311/2 Food
313 Beverages
314 Tobacco
321 Textiles
322 Clothing
323 Leather
324 Shoes
331 Wood
332 Furniture

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13, ECA, Statistical Yearbook, various issues.

14, World Investment Report 1996

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19, FAO; African Agriculture: the next 25 years.

20, FAO, Fisheries Yearbook 1995

ANNEX 2

RESULTS OF CLUSTER ANALYSIS PERFORMED ON INDIVIDUAL COMPONENTS OF THE AIS SYSTEM OF 44 AFRICAN COUNTRIES

Description of Country Groups

TABLE A-1

Natural Resources

No	Group Description	Countries
1	Very large natural resources in wood, water and cropland.	Botswana, Central African Republic, Gabon, Namibia and Congo.
2	Countries with large natural resources.	Angola, Sudan and South Africa
3	Large cultivated area.	Cameroon, Chad, Togo, Tunisia and Zambia.
4	Average cultivated area, low in forest resources(excep. Zaire) with apparent good forest management.	Algeria, Cote d'Ivoire, Ghana, Madagascar, Morocco and Zaire.
5	Above average cultivated area. Lowest in water resources and poor in wood resources. Above average cultivated area.	Benin, Burkina Faso, Lybia, Niger and Uganda.
6	Large to medium countries with low endowment in natural resources.	Ethiopia(incl. Eritrea), Kenya, Mali, Mauritania, Mozambique, Nigeria, Somalia and Tanzania.
7	Medium to small countries poorly provided in natural resources.	Burundi, Gambia, Lesotho, Mauritius, Rwanda, Swaziland, Egypt, Guinea, Malawi, Senegal, Sierra Leone and Zimbabwe

Variables used: Arable and permanent cropland, forests and annual internal renewable water resources, expressed in per capita terms; indicator of fuelwood demand balance and total grazing area.

Table A-2

INVESTMENTS FOR ENHANCING LAND POTENTIAL

No	Group Description	Countries
1	The highest investment in all areas considered[8]	Egypt
2	High level of investments, second only to Egypt	Lybia, Swaziland
3	High regional use of fertilizers but low level of mechanization	Mauritius
4	Regional relatively high use of inputs to agriculture in all areas	Algeria, Botswana, Congo, Morocco, South Africa, Tunisia, Zimbabwe.
5	Countries with generally low levels of use of inputs	Angola, Gabon, Benin, Gambia, Guinea, Lesotho, Mauritania, Namibia, Nigeria, Sierra Leone, Somalia, Zaire, Burkina Faso, Burundi, Cote d'Ivoire, Ethiopia (incl. Eritrea), Ghana, Kenya, Madagascar, Mali, Mozambique, Niger, Senegal, Uganda, Zambia.
6	The group with the lowest regional use of inputs to agriculture	Cameroon, Central African Republic, Chad, Malawi, Rwanda, Sudan, Togo, Tanzania.

Variables used: Share of cultivated land under irrigation, arable land, annual fertilizer consumption, tractors/Ha and imports of pesticides.

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mechanisation, fertilizers, irrigation, pesticides

Table A-3

HUMAN RESOURCES

No	Group Description	Countries
1	Countries with the highest regional standards in health and education.	Algeria, Botswana, Egypt, Mauritius, Morocco, Namibia, South Africa, Swaziland, Tunisia.
2	Regional high levels in education, health standards lower than group 1.	Kenya, Lybia, Zimbabwe.
3	Lower levels registered in indicators than those of previous clusters, but still above regional averages.	Cameroon, Congo, Gabon, Ghana, Lesotho, Madagascar, Malawi, Rwanda, Tanzania, Zaire, Zambia.
4	Lower levels in education variables than those registered by previous clusters and the lowest regional level of life expectancy.	Nigeria, Sierra Leone, Somalia, Sudan.
5	The group with the lowest regional standards in education and health.	Angola, Benin, Burkina Faso, Burundi, Cote d'Ivoire, Ethiopia (incl. Eritrea), Gambia, Guinea, Mali, Mauritania, Mozambique, Niger, Senegal, Uganda, Central African Republic, Chad, Togo.

Variables used: Life expectancy, enrolment in primary and secondary education, pupil/teacher ratio, achievers in primary education, females in secondary education (%) and adult illiteracy rate.

Table A-4

ECONOMIC STRUCTURE

No	Group Description	Countries
1	Most advanced economies in the region	Egypt, Morocco, South Africa, Tunisia, Zambia, Zimbabwe, Swaziland, Mauritius and Algeria.
2	Mixed industrial/agricultural economies with lower levels of industrial development than group 1. Highly export oriented economies (>50% exports in GDP).	Angola, Botswana, Gambia, Lesotho, Lybia, Gabon.
3	Mixed (agricultural/industrial) economies with high levels of exports.	Congo, Sierra Leone, Cote d' Ivoire, Kenya, Mauritania and Sudan.
4	Generally low income agricultural economies with low export ratios	Zaire, Burkina Faso, Burundi, Cameroon, Central African republic, Chad, Ethiopia, (incl Eritrea) Ghana, Guinea, Madagascar, Malawi, Mali, Mozambique (Namibia) Niger, Nigeria??, Rwanda, Senegal, Somalia, Togo, Uganda, Tanzania.

Variables Used: Share of agriculture, manufacturing and exports in GDP, GDP per capita, debt/export ratio and FDI/GDP.

Table A-5

INVESTMENT ENVIRONMENT

No	Group Description	Countries
1	Low risk in investments, low debt.	Botswana, Mauritius, South Africa
2	Low risk in investments, larger debt	Egypt, Ghana, Morocco, Tunisia, Zimbabwe
3	Relatively low investment risk, high levels of debt, low FDI	Algeria, Cote d'Ivoire, Kenya, Mali, Mauritania, Niger, Uganda, Zambia
4	Medium investment risk, high debt, high FDI	Angola, Cameroon, Chad, Gabon, Gambia, Lesotho, Malawi, Nigeria, Togo
5	Medium risk investment, high debt, low FDI	Benin, Burkina Faso, Central African Republic, Ethiopia, Guinea, Madagascar, Senegal, Tanzania
6	Countries with exceptionally high FDI	Namibia, Swaziland
7	Highest investment risk, low FDI, no information on debt	Lybia, Mozambique, Rwanda, Somalia, Sudan, Zaire, Burundi
8	Countries with very high investment risk and heavily indebted	Congo, Sierra Leone

Variables used: Debt/export ratio, FDI/GDP, Credit risk.

Table A-6
SIZE AND PERFORMANCE OF AGRICULTURE

No	Group Description	Countries
1	Agricultural countries with growing production	Benin, Burkina Faso, Chad, Ghana, Niger, Nigeria, Togo, Uganda,
2	Agricultural countries with low growth in production	Somalia, Sudan.
3	Countries exhibiting high growth in agricultural exports	Congo, Gabon, Gambia, Guinea, Mauritania, Morocco, Tunisia, Zimbabwe
4	Countries with the highest labour force in agriculture, low productivity indices and generally decreasing agricultural exports	Burundi, Cameroon, Central African Republic, Cote d'Ivoire, Ethiopia (incl. Eritrea) Kenya, Madagascar, Malawi, Mali, Mozambique, Rwanda, Senegal, Sierra Leone, Tanzania, Zambia.
5	Countries with relatively low agricultural activity within the total economy but with stable indices of production	Algeria, Angola, Botswana, Egypt, Lesotho, Namibia, South Africa, Swaziland, Zaire.

Note: Groups 2 and 4 have serious difficulties, the most critical situation seems to be found in group 4.

Variables used: Share of agriculture in total GDP, Share of labour force in Agriculture, Agricultural production index.

Table A-7

ANNUAL MEAT PRODUCTION FROM INDIGENOUS ANIMALS [9]

No	Group Description	Countries
1	Large Producers (>18 k/capita) Production growing during the period [10]	Namibia ,Botswana ,Swaziland, South Africa, Central African Republic, Chad, Mauritania.
2	Medium-high producers (10-15 Kg/capita) exhibiting slow growth during the period, exceptions being Algeria and Mali	Mali, Somalia, Madagascar, Sudan, Algeria, Kenya, Lesotho.
3	Medium-low producers (7-10 Kg/capita)	Tunisia, Cameroon, Senegal, Burkina Faso, Niger, Morocco, Tanzania, Uganda, Angola, Egypt, Nigeria, Ethiopia(including Eritrea)
4	Low Producers Less than 7 Kg/capita	Zimbabwe, Gambia, Togo, Zambia, Lybia, Benin, Cote d'Ivoire, Ghana, Mozambique, Gabon, Burundi, Guinea, Congo, Rwanda, Zaire, Mauritius, Sierra Leone, Malawi.

Variables used: Meat from indigenous animals, excluding pigs and poultry

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Excluding pig and poultry

Period 1989-91 to 1995. An exception being Mauritania.

Table A-8

ANNUAL LEATHER AND SKINS PRODUCTION IN THE AFRICAN REGION-1995

No	Group Description	Countries
1	Largest Regional Producers with above average growth, outstanding in Botswana[11].	Botswana, Namibia
2	Production Level Above Regional Average, with high growing rates (>10% during the period)	Swaziland, Central African Republic, Chad, Mali, Senegal, Algeria, Tunisia, Morocco, Niger, Cameroon, Egypt.
3	Above Regional Average Producers, with small or negative growth during the period .	South Africa, Somalia, Sudan, Mauritania, Kenya, Tanzania, Lybia, Lesotho, Madagascar, Burkina Faso, Ethiopia (incl.. Eritrea).
4	Below Regional Average Producers, production level above 0.5 Kg/capita	Angola, Nigeria, Uganda, Gambia, Benin, Zimbabwe, Zambia, Cote d'Ivoire, Burundi.
5	Producers Below 0.5 KG./capita	Mauritius, Togo, Ghana, Guinea, Sierra Leone, Mozambique, Gabon, Rwanda, Zaire, Congo, Malawi.

Variables used: Annual production in k/capita and trends in growth

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25% in period 1990-1995

Table A-9

REGIONAL WOOL PRODUCERS 1995

No	Group Description	Countries
1	Largest Per capita Producers (1.3-2.4 kg/capita) production growing (remarkably high growth in Lesotho 69% during the period [12])	Swaziland and Lesotho
2	Second largest Producers (>0.9 <1.0 Kg/capita) production increasing, outstanding growth registered in Sudan (52%)	Algeria, Namibia, Sudan, South Africa
3	Third Largest per capita Producers (>0.4< 0.7 Kg/capita)	Lybia, Sudan, Morocco, Tunisia
4	Minor per capita Producers (<0.15 Kg per capita)	Ethiopia,(incl. Eritrea), Tanzania, Zimbabwe, Kenya, Egypt.
5	Not significant producers	The rest.

Variables used: Annual per capita production and trends in growth.

Period: 1990-1995

Table A-10

FISH PRODUCERS IN THE AFRICAN REGION

No	Group Description	Countries
1	Largest Producers (>30 kg/capita) with a total catch between 85,000 and 750,000 MT per year. High rates of growth, Mauritania the exception.	Namibia, Senegal, Morocco, Mauritania.
2	Second largest Producers (10-20 Kg/capita) Annual catch between 63,000 and 300,000 MT per year. Unstable growth of catches within the group.	Ghana, Sierra Leone, South Africa, Chad, Tanzania, Uganda.
3	Small countries with 10 Kg/capita of Production. Catches between 20-30,000 MT/year.	Gambia, Gabon, Mauritius and Congo.
4	Countries with catches above 100,000 MT/year, Production levels below 10 Kg/capita. Steady growth in catch within the group, Nigeria an exception.	Madagascar, Kenya. Egypt, Algeria, Zaire, Nigeria.
5	Countries with per capita production between 3 and 10 K/capita, Catch between 23,000 and 86,000 MT. Negative growth in catches is frequent.	Tunisia, Zambia, Angola, Benin, Guinea, Mali, Cote d'Ivoire, central African Republic, Burundi, Togo.
6	Countries with the Lowest levels of per capita production (below 3 k/ year).. Catches between 35 and 58,000 MT per year. Unstable growth, exception being Ethiopia and Sudan.	Zimbabwe, Mozambique, Somalia, Lybia, Sudan, Botswana, Burkina Faso, Malawi, Rwanda, Niger, Ethiopia (incl. Eritrea), Swaziland, Lesotho.

Variables used: Annual catches, MT and trends in growth.

Table A-11

INFRASTRUCTURE SUPPORTING INDUSTRY.

No	Group Description	Countries
1	Very high levels in both indicators.	Algeria, Egypt, Lybia, Morocco, South Africa, Tunisia, Zimbabwe.
2	High installed electrical capacity and low number of phones.	Mozambique, Nigeria, Zambia, Zaire.
3	Low installed electrical capacity and high number of phones.	Gabon, Madagascar, Mauritania, Mauritius, Togo, Swaziland.
4	Countries with medium levels in both variables.	Ghana, Cote d' Ivoire, Kenya, Angola, Botswana, Namibia.
5	Countries with poor industrial infrastructure	Cameroon, Sudan, Ethiopia, Tanzania, Senegal, Guinea, Uganda, Sierra Leone, Congo, Mali, Burkina Faso, Somalia, Niger, Burundi, Central African Republic, Rwanda, Chad, Gambia, Benin, Lesotho.

Variables used: Installed electrical capacity and telephones per 100 people as proxy variables.

Table A-12

Size and Performance of Manufacturing

No	Group Description	Countries
1	Regional highly industrialized countries (MVA> 20%) with a growing share in the regional MVA	Lybia, Swaziland and Zambia
2	Growing share in African MVA, with mixed levels of industrialization	Benin, Burkina Faso, Congo, Guinea, Lesotho, Mauritius, Morocco, Namibia, South Africa, Tunisia, Uganda.
3	MVA/GDP between 10 and 20%, but with decreasing share in the regional MVA	Burundi, Cameroon, Chad, Cote d'Ivoire, Egypt, Ghana, Malawi, Senegal, Zimbabwe, Sudan, Mozambique.
4	Low and decreasing levels of industrialization	Algeria, Botswana, Central African Republic, Gabon, Gambia, Kenya, Madagascar, Mali, Mauritania, Niger, Angola, Togo, Ethiopia, Nigeria?? Rwanda, Sierra Leone, Somalia, Tanzania, Zaire.

Variables Used: Country share of MVA in total Africa, average annual growth in MVA/GDP, country share in manufacturing exports in the region, MVA/GDP, MVA/total exports.

Table A-13

DOMESTIC (INTERNAL) DEMAND

No	Group Description	Countries
1	Regional high income countries, with high levels of access to safe water.	Algeria, Tunisia, Botswana, Mauritania, Lybia.
2	Income per capita, urbanization and access to safe water above regional average.	Cote d'Ivoire, Egypt, Gabon, Mauritania, Morocco, Namibia, South Africa.
3	Income and living standards along the average, but relatively uurbanized	Benin, Cameroon, Congo, Ghana, Nigeria, Senegal.
4	High income per capita and very rural.	Swaziland
5	Relatively poor and very rural. Access to safe water above 50%.	Burkina Faso, Gambia, Guinea, Kenya, Lesotho, Malawi, Niger, Sudan, Togo, Tanzania, Zaire, Zimbabwe.
6	Poor and rural countries.	Angola, Central African Republic, Chad, Ethiopia, Madagascar, Mali, Mozambique, Sierra Leone, Somalia, Uganda, Zambia.
7	The poorest and most rural countries.	Burundi and Rwanda.

Variables used: GDP/ capita, Urban Population/total population, Access to Safe water.

Table A-14

External Demand

No	Group Description	Countries
1	High exporting countries exhibiting a high content of manufactured products in total exports	Egypt, Zambia, Burundi, Cote d'Ivoire, Gambia, Ghana, Kenya, Mauritania, Mauritius, Morocco, Mozambique, Senegal, South Africa, Tunisia, Tanzania, Zimbabwe.
2	Low exporting countries but with a high content of manufactured products	Ethiopia, Madagascar, Rwanda, Uganda, Niger
3	High exporting countries with a very low content of manufactured products in their total exports	Congo, Angola, Botswana, Gabon, Lesotho, Namibia, Swaziland, Lybia
4	Regionally low exporters with a low content of manufactured products in their total exports	Algeria, Cameroon, Chad, Nigeria, Somalia, Sudan, Togo, Zaire, Burkina Faso, Benin, Central African Republic, Malawi, Mali, Sierra Leone, Guinea.

Variables used: Share of total exports in GDP, Share of manufacturing exports in total exports.

BASE DIAGRAM OF AGRO-INDUSTRIAL SYSTEMS (AIS)

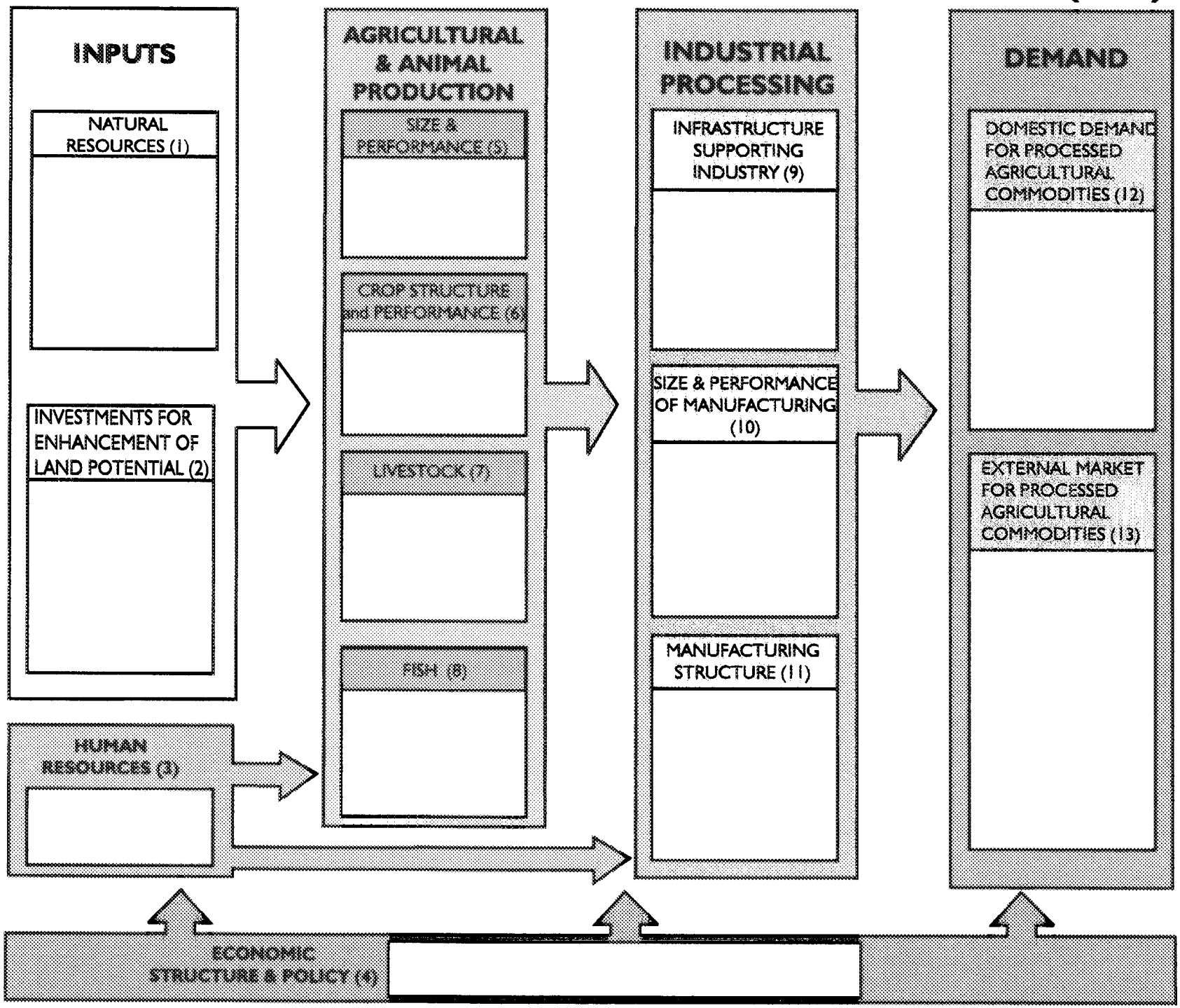

FIGURE 1