

Consultative Group on International Agricultural Research

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Agenda Item 6 - Review of CGIAR Priorities and Strategies

**A Review of CGIAR Priorities - Part II**

**Essence Paper**

1. Attached is a copy of the report "A Review of CGIAR Priorities - Part II: Essence Paper" (AGR/TAC:IAR/91/14 (B) which contains a compact summary of TAC's analysis of CGIAR priorities. Details of the analysis are in the main document "A Review of CGIAR Priorities - Part I: Advanced Working Draft" (AGR/TAC:IAR/91/14.1 (A).
2. This document along with the main report will be considered by the Group at ICW'91 under Agenda Item 6.

Attachment

Distribution

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TAC Secretariat

THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH  
TECHNICAL ADVISORY COMMITTEE

A REVIEW OF CGIAR PRIORITIES - PART II:

ESSENCE PAPER

TAC SECRETARIAT  
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
September 1991

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

Alex F. McCalla  
Chair

12 September 1991

Dear Mr. Thalwitz,

It is my pleasant duty to transmit to you, and through you to the CGIAR, an advanced working draft of the latest TAC Review of CGIAR Priorities. The report is in two parts. The major document, "A Review of CGIAR Priorities: Advanced Working Draft", presents in considerable detail TAC's analysis of priorities. The second paper, "A Review of CGIAR Priorities: Essence Paper", presents a compact summary of the larger document. I should remind you that TAC is not providing final recommendations at this stage. It is simply highlighting the major issues, some tentative conclusions, and stating some hypotheses based on the results and trends emerging from the analytical framework used.

TAC's efforts to develop an analytical framework that is comprehensive, quantitative, and transparent were time consuming but rewarding. The analysis presented in the main report attempts to integrate into the analytical framework the multifaceted dimensions of the CGIAR mission and goals. This framework provided valuable inputs into TAC's decision-making. But in the end TAC's collective judgement will produce the final recommendations.

The review process has been somewhat delayed by the simultaneous need to carry out a comprehensive evaluation of the possible expansion of the CGIAR. Delays were also caused by the Gulf War and by problems with the data base. But a more important reason for producing an advanced working draft is that TAC wishes the review process to be interactive and transparent. It has therefore decided to finalize its recommendations on CGIAR priorities and future strategies only after CGIAR donors, Centre Directors and Board Chairs, and national research systems have had a further opportunity to provide their inputs. Thus our task is not yet complete.

Mr. Wilfred P. Thalwitz  
Chairman  
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The main report is in four parts. Part One provides the context of the review (Chapters 1-3). Part Two deals with the identification of research problems, and also provides background information necessary for the analysis (Chapters 4-8). Part Three is the TAC analysis of priorities (Chapters 9-11). Part Four (Chapter 12) discusses the implications of the analysis for CGIAR priorities and future strategies. The essence paper is structured such that Chapter 1 is equivalent to Part One of the main document. Similarly Chapters 2, 3, and 4 of the essence document parallel the remaining three parts of the main document.

The paper is a TAC report but I must pay special thanks to several people without whose hard work the task would not have been completed. Professor C.T. de Wit and the members of the TAC Standing Committee on Priorities and Strategies developed the methodology and proposed alternative approaches to TAC. John Monyo and the TAC Secretariat have provided continuing and valuable support. Particular thanks must go to Guido Gryseels whose efforts were invaluable and far beyond the call of duty. Finally we note the valuable assistance received from the CGIAR Secretariat, FAO and many CGIAR institutes, particularly ISNAR and IFPRI.

We look forward to a stimulating discussion of the draft at ICW'91.

Yours sincerely,



Alex McCalla  
Chairman, TAC

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## A REVIEW OF CGIAR PRIORITIES:

### ESSENCE REPORT

#### 1. The Setting

##### 1.1. Purpose

This paper synthesizes the latest draft document developed by TAC on CGIAR priorities. The document reviews the evolution of the CGIAR and its priorities in the light of probable future demands for international strategic research in selected aspects of agriculture, forestry and fisheries in developing countries, the recommendations of the 1986 TAC review of CGIAR priorities and strategies, and the 1990 TAC paper on "A Possible Expansion of the CGIAR". It was prepared by TAC to facilitate interaction with centres, national research systems and donors. Comments received from these and other stakeholders will serve as a major input into the revision of the draft.

##### 1.2. Background and Context

The CGIAR decided at its mid-term meeting in 1987 in Montpellier that the assessment of priorities and strategies would become a continuing activity of TAC, and that a major update would be made every five years. The last comprehensive review of CGIAR priorities and strategies was completed in 1986. The next substantive revision is therefore due for consideration by the CGIAR at ICW'91.

TAC makes recommendations on priorities in order to guide the allocation of resources across the system, allowing an appropriate balance among centres, activities, commodities and regions. It also evaluates possible new initiatives or activities for their consistency with these priorities.

TAC's objective is to provide two major outputs from its current review of CGIAR priorities:

- a priorities and strategies document that reflects the major recommendations to the Group regarding its future;
- the development of a transparent analytical process that enables TAC to adapt CGIAR priorities and strategies to changing circumstances.

The draft developed so far deals only with CGIAR priorities. TAC will finalize its recommendations on priorities and add the strategies component after considering the views of centres, national research systems and donors, and on completion of the current discussions on ecoregional mechanisms, the future structure of the CGIAR, and relationships between CGIAR centres and national systems. The final report will also outline mechanisms for linking CGIAR priorities with resource allocation.

TAC's recommendations on priorities will be made at CGIAR system rather than programme level. Priorities will be identified by categories of activities, regions, agro-ecological zones, major production sectors, commodities, and subject matter areas of global significance.

TAC recognizes that the CGIAR is a small (though significant) component of the global research system, and that it has very limited financial resources relative to the substantial demands placed on it. Consequently the CGIAR has to be very selective in its role and choice of research portfolio.

Since its inception in 1971, the CGIAR has remained a dynamic enterprise. The early emphasis on cereals has been broadened to incorporate grain legumes, livestock, roots and tubers, banana and plantain, policy research, and the strengthening of national research systems. More recently, irrigation management, vegetables, forestry and fisheries have been added. The mission and goals have shifted from a narrow initial focus on food self-sufficiency to a broader focus with food self-reliance as the primary objective. The number of institutions has more than quadrupled from the initial four centres, and the scope of activities has expanded substantially. Research still commands the largest share of resources, followed by the strengthening of national research systems.

The share of resources allocated has declined for cereals, remained constant for roots and tubers, increased steadily for grain legumes, and doubled for livestock. There has been increasing awareness of issues relating to sustainability, resource management, environmental degradation, income generation and partnerships with national research systems.

### 1.3. Mission, Goals and Activities

In its paper, "A Possible Expansion of the CGIAR", TAC redefined the mission of the CGIAR as follows:

"Through international research and related activities, and in partnership with national research systems, to contribute to sustainable improvements in the productivity of agriculture, forestry and fisheries in developing countries in ways that enhance nutrition and well-being, especially for low-income people".

The above statement implies a focus on:

- international research that complements and supports national research efforts;
- complementary activities aimed at strengthening national research capacities, such as specialized training, institution building and information services;
- satisfying human needs from agriculture, forestry and fisheries, without degrading the natural resource base;



- the importance of technological change in generating new income streams for the large numbers of poor people living in developing countries.

The ultimate aims of the CGIAR are improved nutrition and economic well-being for low-income people. Research should contribute to self-reliance by increasing the purchasing power of the poor through lower costs and prices, and through greater equity in the distribution of incomes. It should also contribute to the quality of plant and animal products, to sustainability and stability in their supply, and to the enhancement of the natural resource base.

TAC has also reformulated the goals of the CGIAR as follows: (i) effective management and conservation of natural resources for sustainable production; (ii) improved productivity of high priority crops, (iii) livestock, (iv) trees, and (v) fish, and their integration into sustainable production systems; (vi) improved utilization of crop, livestock, tree and fish products in both rural and urban areas through improved post-harvest technology; (vii) progress towards equity (including gender equity), as well as improved diets, nutrition and family welfare through better understanding of the human linkages between production and consumption; (viii) appropriate policies for increased productivity of crops, livestock, trees and fish, and for the sustainable use of natural resources; and (ix) strengthened human resources and institutions for greater research capacity in developing countries' research systems.

The level and nature of the CGIAR's future involvement with each of these goals will vary greatly, but all are recognized as essential concerns. The aim is to contribute to the nine goals through research and institution building. Through research, CGIAR centres also contribute to science.

The nine goals are closely inter-related. The first five refer to the management of natural resources and their integration into sustainable production systems. The next three relate to socio-economic, public management and public policy concerns. The last focuses on strengthening national research systems. All goals converge on the central mission of the CGIAR through five major categories of activities:

- conservation and management of natural resources (including genetic resources);
- germplasm enhancement and breeding;
- the development of sustainable production systems for agriculture, forestry and fisheries;
- socio-economic, public policy and public management research;
- strengthening of national research systems.

Each of these categories includes particular activities which form the building blocks of projects designed to contribute to one or more of the nine goals.

#### 1.4. Framework for Priority Setting

##### 1.4.1. Process and approach

TAC regards priority setting as an interactive process in which the CGIAR's stakeholders are provided with opportunities to contribute. The process involves making choices between competing demands and assigning weights to alternative options, so that the relative emphasis to be assigned to commodities, activities, regions and entities can be determined.

The current approach to priority setting differs from the one used in 1986. It has been modified to take into account the expanded mandate of the CGIAR, the need to give greater emphasis to sustainability issues, to ensure transparency and to develop mechanisms which will allow priority setting to become a continuing activity. TAC has also made use of a formal analytical framework as an aid to (but not a substitute for) informed qualitative judgement and decision making. It should be stressed that the framework used is not an optimizing procedure, but aims only at clarifying choices. It allows TAC to make the process of arriving at priorities a transparent one so that a reasoned dialogue with other stakeholders, such as national programmes, centre Directors, Board Chairs, and CGIAR members, is facilitated.

##### 1.4.2. Guiding factors

Eight factors have guided TAC in its consideration of CGIAR priorities. They were: first, the CGIAR mission and goals; second, emerging trends in the agriculture, forestry and fisheries sectors of developing countries; third, changes in science and its organization; fourth, the evolution of scientific capacity in developing countries; fifth, the relative importance of sectors and commodities across regions and agro-ecological zones; sixth, the importance and international character of the major constraints to production that are amenable to solution through research; seventh, the nature of the research required and the potential for breakthroughs; eighth, the comparative advantage of the CGIAR to undertake such research.

##### 1.4.3. A three-dimensional framework

The analytical framework used by TAC had three dimensions: first, an activities dimension, including the five categories of research activities stated in Section 1.3; second, a spatial dimension, with nine agro-ecological zones (AEZs) and four geographic regions; third, a product dimension, with four main production sectors and their respective commodities (these are discussed in Section 4).

##### 1.4.4. Agro-ecological characterization

TAC used the zonation developed by FAO as the agro-ecological zones component of its analytical framework. Nine zones were distinguished: (1) warm arid and semi-arid tropics; (2) warm subhumid tropics; (3) warm humid tropics; (4) cool tropics; (5) warm arid and semi-

arid subtropics with summer rainfall; (6) warm subhumid subtropics with summer rainfall; (7) warm/cool humid subtropics with summer rainfall; (8) cool subtropics with summer rainfall; and (9) cool subtropics with winter rainfall. Where possible, agro-ecological boundaries were reconciled with political boundaries in order to link socio-economic and natural resources data. The application of the zonation to the four developing regions resulted in a matrix of 23 regional agro-ecological zones (RAEZs): 4 in sub-Saharan Africa, 3 in West Asia-North Africa, 7 in Asia and the Pacific and 9 in Latin America and the Caribbean. However, results are reported for 21 regional agro-ecological zones because the three in West Asia-North Africa were combined.

## 2. Global Trends and Research Issues

Among the major factors shaping international strategic research in agriculture, forestry and fisheries in the next 20 to 30 years will be population growth, income growth and urbanization. These factors will determine the demand for food, which is expected to double in developing countries by the year 2025.

Population growth is the main determinant of increasing food demand. The United Nations medium variant projection estimates that the population of developing countries will increase from 3.6 billion in 1985 to 5.8 billion in 2010 and 7.0 billion in 2025 (United Nations, 1988). At present, about 75% of the world's population lives in developing countries. This proportion will increase to 79% in 2000, 81% in 2010, and 83% in 2025. The population of sub-Saharan Africa is expected to expand threefold by 2025. Asia's population increase will be the largest in absolute terms of any world region; the population of this region will grow from 2.6 billion in 1985 to 4.4 billion in 2025.

Income growth is a significant factor determining the composition, as well as the level, of food demand. Estimating income growth over the long term is difficult because such growth is determined largely by highly unpredictable factors such as political developments, the level of energy prices, and national economic and trade policies. The World Bank has projected an average annual growth rate in per caput income of 2.0% over the next decade for developing countries as a group, but zero growth is expected for sub-Saharan Africa. This means that, in most developing countries, food consumption will increase and there will be a shift in diets from staple grains to livestock products and vegetables. Increases in the demand for livestock products will lead in turn to a rise in the demand for feed grains.

Urbanization is also a major factor determining the composition of food demand. At present 31% of the population of developing countries lives in urban areas, but this is expected to increase to 40% by 2000 and to 57% by 2025. The diets of urban consumers tend to consist of high-value cereals, livestock products and vegetables. To cater for the needs of urban consumers, more food processing is required. Urbanization also affects the mode of food supply, since more food has to be produced for market rather than subsistence. Food produced for urban markets needs to be transported and stored. Cities are usually located on better soils,

sizeable amounts of which are taken out of agricultural production as they grow in size.

With respect to the demand for forestry products, for many of the poor in developing countries, the demand for fuelwood already greatly outstrips supply, particularly in dry areas. FAO has estimated that more than 100 million people experienced acute fuelwood scarcity during the early 1980s (FAO, 1983). With rising incomes, the demand for other sources of energy will increase, reducing the pressure on fuelwood markets to some extent. As population rises, the demand for building materials from trees will also rise. Tree products in general will become an increasingly important source of cash income for small-scale farmers and landless labourers.

The demand for fish and fish products has been growing rapidly in recent years. The traditional sources of fish - seas and rivers - have for the most part already been fully exploited. This has led to rapidly increasing prices for fish and fish products, a trend likely to accelerate in the coming decades.

Malnutrition and poverty remain common features of the developing world. People are malnourished either because not enough food is available or because they are too poor to buy available food. The World Bank has recently estimated that 1.1 billion people, or 33% of the population of developing countries, live in poverty (World Bank, 1990). About three-quarters (800 million) of them live in Asia, although proportionally Africa has more poor people than any other region.

The implications of these numbers are awesome. Even if the agricultural land area continues to expand at the same rate as over the last two decades - an optimistic assumption - yields of the world's major marketed crops will have to more than double simply to maintain current per caput consumption. Meeting the demand for more food will remain the central challenge facing research by the CGIAR system.

Producing more food will increase pressures on the natural resource base. It will therefore become necessary to pay greater attention to research on resource management. Research topics at the global level will include the substitution of renewable for non-renewable resources, the conservation of genetic resources, and studies of possible or actual changes in global atmosphere and climates. Greater attention will also need to be paid to issues of poverty, malnutrition and equity, especially gender equity.

The strength of national research systems in developing countries will greatly affect the scope and quality of research and its impact. The varying capacities and resource endowments of national programmes will alter their collaborative relationships with centres. This must be taken into account in planning future strategies at international level.

To further analyze the critical dimensions of the research challenge, TAC developed a substantial data base on natural resources, production and socio-economic characteristics. Brief characterization of major research challenges by agro-ecology and regions are also provided in Chapter 4 of the main report. Research issues relating to crops,

livestock, forestry and fisheries are in Chapters 5, 6, 7 and 8 of the main report.

### 3. The Analysis

#### 3.1. Introduction

TAC's analysis was conducted in three parts. The first was a comprehensive quantitative analysis based on regionally defined agro-ecological zones. A modified congruence approach was taken using a composite base weight made up of value of production, number of poor people and total useable land area. The composite base was then modified by a series of variables (modifiers) to take into account issues of efficiency, equity, sustainability, strength of national programmes, self-reliance and potential for agroforestry. The results after application of the modifiers provided insights and inputs for priority setting by agro-ecological zone, region, production sector and commodity. They also provided insights regarding policy, management and institution building challenges.

The second part was an analysis of needs relating to the strengthening of national research systems and information services. This part ended with tentative proposals regarding possible future roles for the CGIAR.

The third component of the analysis addressed research needs in socio-economics, public policy and public management.

#### 3.2. Analysis Based on Agro-ecological Zones

##### 3.2.1. Congruence approach

Congruence approaches are commonly used to assign priorities to research on commodities in proportion to their value of production. The approach assumes that opportunities to increase productivity through research are equal across commodities and that gains in productivity are proportional to the value of the new knowledge obtained from the research.

The congruence approach can be used initially to distribute priorities across regional agro-ecological zones. The data used for this purpose are extensity parameters, such as the value of production, the number of poor people or the area of agricultural land; such extensity data are suitable because they can be added across regions and zones. Intensity data on regions, such as GDP per caput and production per ha, cannot be used directly in the same way, but can be used to modify the baseline for priority setting as discussed in Section 3.2.3.

##### 3.2.2. Baseline for priority setting

In selecting extensity parameters for the baseline of the congruence analysis, TAC decided that value of production alone was an insufficient starting point. This was because value of production is heavily influenced by the degree to which commodities are traded and the prices at which they are valued.

TAC therefore added two further extensity parameters to the value of production in order to take into account other CGIAR goals. These were the numbers of poor people and the total area of useable land, which reflect the equity and sustainability objectives of the CGIAR. All three parameters emphasize the efficiency of research, because research done to enhance productivity, alleviate poverty and promote sustainability has greatest impact where the value of production, the number of poor people and the area of useable land are all large.

The total value of production in developing countries from the agriculture, forestry and fisheries sectors is US\$ 600 billion per annum, of which agriculture accounts for 76%, forestry for 20% and fisheries for 4%. The number of poor people totalled 1,110 million and was defined on the basis of World Bank data (income per caput of less than US\$ 370 per annum). The total useable land area included cultivated land (arable and permanent cropland), grazing land, and forests and woodland.

TAC set separate baselines for agriculture, forestry and fisheries. For agriculture (see Table 3.1.), the three parameters were all used with equal weighting. Each was normalized to sum to 1000 and the three sets of numbers were then averaged to give the baseline allocation. Equal weighting was given on the basis that research yields the highest pay-off if new technologies are developed where the level of production, the numbers of poor benefitting, and the land area available for production are greatest.

The value of production, number of poor people and area of useable land are highest in Asia, although in the case of the area of useable land the shares of sub-Saharan Africa, Latin America and the Caribbean approach that of Asia. The net effect of including the useable land area is to yield a baseline value for Asia which is lower than the value of production, while that for sub-Saharan Africa becomes larger.

For forestry, TAC felt that the baseline should consist of the value of forest production, the numbers of poor people and the area of wooded land, weighted 0.17, 0.33 and 0.50 respectively. These weightings reflect the belief that the value of production is heavily skewed by the value of commercial log and timber production, which lies outside the scope of CGIAR and Bellagio II priorities, and that the scope for forest preservation and multiple use would be better captured by data on wooded area. The weighted baseline assigns 24% to sub-Saharan Africa, 4% to West Asia-North Africa, 45% to Asia and 28% to Latin America and the Caribbean.

The fisheries baseline consists of only two factors - the value of production and the numbers of poor people, each weighted 0.5. For obvious reasons, the terrestrial agro-ecological zone approach did not apply! The regional distribution of the weighted baseline was 11, 5, 65 and 19% to sub-Saharan Africa, West Asia-North Africa, Asia, and Latin America and the Caribbean respectively.

Table 3.1. Baseline for Agriculture: Distribution by Region (%)

| Weight        | 0.33          | 0.33               | 0.33                |                 |
|---------------|---------------|--------------------|---------------------|-----------------|
| Factor        | V.O.P.<br>(%) | No. of Poor<br>(%) | Useable Land<br>(%) | Baseline<br>(%) |
| <u>Region</u> |               |                    |                     |                 |
| SSA           | 11.1          | 16.2               | 28.1                | 18.9            |
| WANA          | 7.1           | 5.4                | 12.3                | 6.7             |
| ASIA          | 60.4          | 72.1               | 33.3                | 53.5            |
| LAC           | 21.4          | 6.3                | 26.4                | 21.0            |
| WORLD         | 100.0         | 100.0              | 100.0               | 100.0           |

### 3.2.3. Modifications of the baseline

#### 3.2.3.1. Procedures

TAC then considered how the baselines should be modified by the use of intensity parameters to take into account: (1) the special nature of the CGIAR; and (2) factors relating specifically to equity and sustainability concerns. In the course of the analysis TAC considered 20 modifiers for agriculture and 10 for forestry. In the end, 9 were chosen for agriculture and 6 for forestry. Some of those not used were discarded because TAC judged them inappropriate; others were judged appropriate, but there were no useable data to quantify them for use in the analysis.

The procedure used was to take the raw data for a modifier and normalize them by giving the largest a value of 1 and apportioning the rest. Where necessary, the modifier values were then weighted. Next, the baseline for each regional agro-ecological zone was adjusted for the effect of the modifier. Lastly, the adjusted baseline was normalized to sum to 1000. This process was repeated for each successive modifier.

#### 3.2.3.2. Selection of modifiers

TAC chose modifiers which represented appropriate considerations and for which reasonable data were available. The ten modifiers selected were as follows. One modifier - yield gap - was selected to address the need for research efficiency. Two - intensity of malnutrition and GDP per caput - were selected to reflect equity concerns. Three - "urgency", magnitude of deforestation, and soil degradation risk - were selected to address issues of sustainability. Two - capacity of national systems and

country size, were selected to deal with the need to strengthen national research systems. One attempts to address the issue of food self-reliance and one the preservation of forest resources and the potential for agroforestry. Each modifier is described in more detail in the following sections.

#### 3.2.4. Modifiers chosen

##### 3.2.4.1. Efficiency

Since the baselines already reflected the criterion of efficiency, only one modifier to reflect the need for efficiency was chosen. This was the yield gap or scope for growth, in other words the difference between best possible yields with current technologies and actual performance. Where the gap was narrow and the scope for growth low it was judged that higher priority should be given because strategic research was critical to increasing the yield potential. The potential productivity data used were estimates from the FAO AT2000 database. The values varied from 0.45 in the warm arid and semi-arid tropics of Asia to 0.88 in the warm subhumid tropics of sub-Saharan Africa.

##### 3.2.4.2. Equity

(a) Malnutrition. TAC decided that high priority should be assigned to areas where poverty and malnutrition are severe and widespread. The data used for this modifier were FAO estimates of the number of malnourished as a proportion of total population. The highest proportion was in sub-Saharan Africa (35%) and the lowest in West Asia-North Africa (9%); the proportions for Asia and for Latin America and the Caribbean were 22% and 14% respectively.

(b) GDP per caput. The use of GDP per caput as a modifier enables higher priority to be assigned to poorer areas. Since poorer countries tend to have lower budgets for research and development, this modifier also takes into account the resources likely to be available to national research systems.

##### 3.2.4.3. Sustainability

(a) Urgency. The urgency modifier is based on FAO AT2000 data on the growth in food demand (in grain equivalent) between now and the year 2010. The greater the urgency the more pressure there will be to expand production on marginal or fragile lands. The parameter used was annual increase in food demand as a percentage of current food and cash crop production. Values across regions range from 1.17% in Latin America and the Caribbean to 3.47% for West Asia-North Africa, with Asia 1.45% and sub-Saharan Africa 2.21%. The higher the value, the greater the urgency.

(b) Deforestation. Deforestation can be slowed down by improving productivity and resource management in adjacent agricultural lands. Annual deforestation globally is estimated at 16.8 million ha per year. The modifier used is the proportion of the deforestation occurring in each region, divided by the priority baseline to obtain an intensity dimension.



(c) Soil degradation risk. Land degradation is a major threat to the sustainability of agriculture in various areas of the developing world. Data for this modifier were drawn from the FAO population supporting capacity study (FAO, 1982), which contains a model quantifying the effects of unchecked soil erosion on the long-term productivity of rainfed crop land. This is expressed as the percentage of cropland lost from production if erosion is unchecked. Values range from 11% in Latin America and the Caribbean to 35.6% in Asia.

#### 3.2.4.4. Strength of national research systems

(a) Number of scientists. The first modifier used to take into account the strength of national research systems was the number of scientists by region and by agro-ecological zone (Pardey and Roseboom, 1991). The values were weighted by the baseline value to provide an intensity dimension. Higher priority was assigned to areas with the lowest density of scientists. Again, sub-Saharan Africa emerges as the region in greatest need.

(b) Small countries. Small countries have more difficulty than large ones in finding the resources to develop strong national research systems. The average number of countries within a regional agro-ecological zone, weighted by the baseline value, was therefore used as a modifier.

#### 3.2.4.5. Self-reliance

To capture the self-reliance concept as a modifier, TAC turned to a recent IFPRI study on food aid needs to the year 2000. The need for food aid was estimated as the difference between production plus imports and demand minus exports. Regions with a large food aid gap were given high priority.

#### 3.2.4.6. Forest resource preservation

The encroachment of agriculture on forests not only has unfavourable environmental consequences but also causes fuelwood scarcity. In these areas, high priority should be given to agroforestry. TAC therefore used FAO data on area of forests and woodland per caput as a modifier to indicate pressure on forest resources. Where the area per caput is low and pressures are high - as in West Asia-North Africa and Asia - high priority was assigned.

#### 3.2.5. Impacts of modifiers

TAC addressed two critical questions regarding the application of modifiers - what weight should be attached to each modifier and should all weights be the same across modifiers. TAC concluded that weights should be less than 1, in the range 0.25 to 1, to prevent any single modifier from having undue weight. It was also decided that all modifiers should have equal weights in the absence of compelling reasons for differential weights.

### 3.2.5.1. Agriculture

Table 3.2. shows the impacts (plus or minus) of each modifier on each of the 21 regional agro-ecological zones, the 4 regions and the 9 agro-ecological zones. Several general observations can be made. First, the various modifiers impact differently on each agro-ecological zone and region; no agro-ecology or region is favoured or disfavoured by all modifiers. Second, the net effect of all modifiers is positive for all tropical agro-ecological zones (AEZs 1-4) and negative for all subtropical zones (AEZs 5-9) except AEZ-9, which is predominantly West Asia-North Africa. Third, it follows that the base for sub-Saharan Africa is increased by the net effect of all modifiers because this region contains only tropical zones. The West Asia-North Africa base is also increased by the net effect of all modifiers.

The impact of the baseline values and modifiers chosen by TAC on priorities among commodities was then analyzed by region and by agro-ecological zone. The value of production of the different commodities by regional agro-ecological zone was weighted using a ratio computed from the final priority rankings (modifiers set at 0.5) and initial value of production. The ratio ranged from 4.86 in RAEZ 1 in sub-Saharan Africa to 0.20 in RAEZ 7 in Asia.

Table 3.3. presents the outcome of the weighting process. The first column gives the unadjusted share in value of production of each commodity. The second column represents the adjusted share in value of production of each commodity, assuming that in the analysis by geographic areas weights of modifiers had been set at 0.5. The right hand side of the table shows the distribution of the adjusted value of production of commodities by region. These regional distributions were also compared with the unweighted regional distribution (data not given). The results showed that commodities that are normally produced in Asia and in the subtropics generally reduce in importance as a result of weighting, while commodities produced in the tropics and in sub-Saharan Africa generally rank higher.

### 3.2.5.2. Forestry

The results for forestry are shown in Table 3.4. For the forestry analysis six modifiers were used (five were the same as for agriculture, while the sixth was woodland per caput). Again no agro-ecological zone or region is consistently discriminated against or favoured by all modifiers and the net effect is to increase the base in all tropical agro-ecological zones (AEZs 1-4) and reduce it in all subtropical ones (AEZs 5-9). Again it follows that the base for sub-Saharan Africa increases, while those for the other three regions decrease.

### 3.2.5.3. Fisheries

The results for fisheries are shown in Table 3.5. The baseline for fisheries was modified by only one variable, the malnutrition modifier, and only on a regional basis. Again the malnutrition modifier increases the base for sub-Saharan Africa and reduces it for the other regions.

Table 3.2. Relative Impacts of Agricultural Modifiers by Agro-Ecology and Region (Weight 0.5)

| Agro-Ecology/<br>Region | MODIFIER         |                     |                  |                |                      |                         |                     |                      |                   | Net Effect of all Modifiers |
|-------------------------|------------------|---------------------|------------------|----------------|----------------------|-------------------------|---------------------|----------------------|-------------------|-----------------------------|
|                         | (1)<br>Yield Gap | (2)<br>Malnutrition | (3)<br>GDP/Caput | (4)<br>Urgency | (5)<br>Deforestation | (6)<br>Soil Degradation | (7)<br>Cap. of NARS | (8)<br>Small Country | (9)<br>Import Gap |                             |
| <u>Agro-Ecology</u>     |                  |                     |                  |                |                      |                         |                     |                      |                   |                             |
| AEZ 1                   | +                | +                   | +                | +              | +                    | -                       | +                   | -                    | -                 | +                           |
| AEZ 2                   | -                | +                   | -                | -              | +                    | -                       | +                   | +                    | -                 | +                           |
| AEZ 3                   | +                | +                   | +                | -              | +                    | +                       | +                   | +                    | -                 | +                           |
| AEZ 4                   | +                | +                   | -                | -              | +                    | -                       | +                   | +                    | +                 | +                           |
| AEZ 5                   | +                | -                   | +                | -              | -                    | -                       | -                   | -                    | -                 | -                           |
| AEZ 6                   | -                | -                   | -                | -              | -                    | -                       | -                   | +                    | -                 | -                           |
| AEZ 7                   | -                | -                   | -                | -              | -                    | +                       | -                   | -                    | -                 | -                           |
| AEZ 8                   | -                | -                   | +                | -              | -                    | +                       | -                   | +                    | -                 | -                           |
| AEZ 9                   | -                | -                   | -                | +              | -                    | -                       | -                   | +                    | +                 | +                           |
| <u>Region</u>           |                  |                     |                  |                |                      |                         |                     |                      |                   |                             |
| SSA                     | -                | +                   | +                | +              | +                    | -                       | +                   | +                    | +                 | +                           |
| WANA                    | -                | -                   | -                | +              | -                    | -                       | -                   | +                    | +                 | +                           |
| ASIA                    | +                | -                   | +                | -              | -                    | +                       | -                   | -                    | -                 | -                           |
| LAC                     | -                | -                   | -                | -              | +                    | -                       | +                   | +                    | -                 | -                           |

Table 3.3.

VALUE OF PRODUCTION  
UNADJUSTED AND ADJUSTED FOR  
RAEZ PRIORITIES  
BASE LINE PRIORITY PLUS OVERALL WEIGHT IS 0.5

VALUES OF PRODUCTION PER REGION  
ADJUSTED FOR RAEZ PRIORITIES  
BASE LINE PLUS OVERALL WEIGHT=0.5

|                     | UNADJ. | ADJUST. | AFRICA | WANA | ASIA | LAT.AM. | SUM |
|---------------------|--------|---------|--------|------|------|---------|-----|
| rice                | 16.4   | 11.6    | 8      | 2    | 85   | 5       | 100 |
| wheat               | 6.4    | 4.2     | 4      | 33   | 54   | 10      | 100 |
| maize               | 5.3    | 5.3     | 33     | 5    | 39   | 23      | 100 |
| barley              | 0.5    | 0.5     | 10     | 71   | 14   | 5       | 100 |
| sorghum             | 1.1    | 1.9     | 71     | 2    | 15   | 12      | 100 |
| millet              | 0.7    | 1.4     | 80     | 0    | 19   | 0       | 100 |
| cassava             | 2.6    | 5.1     | 72     | 0    | 18   | 10      | 100 |
| potato              | 1.8    | 1.4     | 10     | 23   | 48   | 19      | 100 |
| sweet potato        | 3.0    | 1.3     | 32     | 0    | 64   | 3       | 100 |
| yam                 | 0.6    | 1.6     | 98     | 0    | 0    | 1       | 100 |
| banana & plantain   | 5.9    | 8.7     | 57     | 1    | 18   | 24      | 100 |
| beans               | 1.2    | 1.3     | 34     | 4    | 37   | 25      | 100 |
| broad beans         | 0.4    | 0.4     | 28     | 28   | 39   | 4       | 100 |
| chick peas          | 0.7    | 0.6     | 8      | 19   | 70   | 3       | 100 |
| lentils             | 0.3    | 0.3     | 3      | 55   | 40   | 3       | 100 |
| groundnut           | 1.9    | 2.5     | 61     | 1    | 36   | 2       | 100 |
| soybean             | 2.6    | 1.6     | 3      | 2    | 22   | 73      | 100 |
| coconut             | 0.8    | 0.9     | 13     | 0    | 81   | 6       | 100 |
| tomato              | 1.3    | 1.4     | 15     | 53   | 13   | 19      | 100 |
| onion               | 0.7    | 0.6     | 11     | 29   | 45   | 15      | 100 |
| cabbage             | 0.4    | 0.3     | 3      | 15   | 74   | 8       | 100 |
| cotton              | 4.6    | 4.1     | 37     | 14   | 34   | 14      | 100 |
| coffee              | 4.3    | 5.5     | 39     | 0    | 14   | 47      | 100 |
| tea                 | 1.2    | 1.2     | 28     | 10   | 60   | 2       | 100 |
| tobacco             | 2.3    | 1.6     | 28     | 10   | 45   | 17      | 100 |
| cocoa               | 1.2    | 2.5     | 78     | 0    | 8    | 14      | 100 |
| sugar               | 1.7    | 1.8     | 25     | 7    | 27   | 41      | 100 |
| rubber              | 1.3    | 1.5     | 15     | 0    | 84   | 1       | 100 |
| oil palm            | 0.8    | 1.1     | 32     | 0    | 63   | 5       | 100 |
| beef & buffalo meat | 4.4    | 5.2     | 38     | 8    | 14   | 39      | 100 |
| sheep & goat meat   | 2.0    | 2.8     | 49     | 25   | 22   | 5       | 100 |
| pig meat            | 6.3    | 4.1     | 6      | 0    | 78   | 16      | 100 |
| poultry meat        | 2.1    | 2.1     | 21     | 16   | 31   | 33      | 100 |
| milk                | 9.9    | 10.7    | 32     | 12   | 34   | 22      | 100 |
| eggs                | 3.1    | 2.8     | 16     | 15   | 44   | 25      | 100 |
| SUM                 | 100.0  | 100.0   | 34     | 8    | 39   | 19      | 100 |

Table 3.4. Relative Impacts of Forestry Modifiers by Agro-Ecology and Region

| Agro-Ecology/<br>Region | MODIFIER             |                      |                       |                       |                      |                      | Net Effect of all Modifiers |
|-------------------------|----------------------|----------------------|-----------------------|-----------------------|----------------------|----------------------|-----------------------------|
|                         | (1)<br>GDP per caput | (2)<br>Deforestation | (3)<br>Soil Deg. Risk | (4)<br>Woodland/Caput | (5)<br>Mal-nutrition | (6)<br>Small country |                             |
| <u>Agro-ecology</u>     |                      |                      |                       |                       |                      |                      |                             |
| AEZ 1                   | +                    | +                    | -                     | +                     | +                    | -                    | +                           |
| AEZ 2                   | -                    | +                    | -                     | -                     | +                    | +                    | +                           |
| AEZ 3                   | -                    | +                    | +                     | -                     | +                    | +                    | +                           |
| AEZ 4                   | -                    | +                    | -                     | +                     | +                    | +                    | +                           |
| AEZ 5                   | +                    | -                    | -                     | +                     | -                    | -                    | -                           |
| AEZ 6                   | -                    | -                    | -                     | +                     | -                    | +                    | -                           |
| AEZ 7                   | -                    | -                    | +                     | +                     | -                    | -                    | -                           |
| AEZ 8                   | +                    | -                    | +                     | +                     | -                    | -                    | -                           |
| AEZ 9                   | -                    | -                    | -                     | +                     | -                    | +                    | -                           |
| <u>Region</u>           |                      |                      |                       |                       |                      |                      |                             |
| SSA                     | +                    | +                    | -                     | -                     | +                    | +                    | +                           |
| WANA                    | -                    | -                    | -                     | +                     | -                    | +                    | -                           |
| ASIA                    | +                    | -                    | +                     | +                     | -                    | -                    | -                           |
| LAC                     | -                    | +                    | -                     | -                     | -                    | +                    | -                           |

Table 3.5. Impact of Modifier on Fisheries Base (Weight 0.5)

| Region | Base | Modified Base |
|--------|------|---------------|
| SSA    | 11.2 | 13.9          |
| WANA   | 4.9  | 4.2           |
| ASIA   | 65.4 | 64.4          |
| LAC    | 18.5 | 17.5          |

### 3.2.6. Impacts of changing weights

#### 3.2.6.1. All weights changed the same

TAC decided to examine the sensitivity of the priority allocation to changes in modifier weights. In addition to the results reported above using a modifier weight of 0.5, data were therefore generated using weights of 0.25 and 1. The results for the regional distribution of priorities for agriculture, forestry and fisheries are presented in Table 3.6. The data show that the modifiers have a significant impact. For example, agriculture in sub-Saharan Africa had an initial base value of 18.9%. When all modifiers were weighted at 0.25, that value increased to 26.5%. A weight of 0.5 increased it still further to 34.1%, while a weight of 1 increased it to 47.2%. The agricultural modifiers favour sub-Saharan Africa and West Asia-North Africa, while the share of Asia is cut almost in half at a weighting of 1.

In forestry, the modifiers favour sub-Saharan Africa at the expense of all other regions. Thus the forestry base weight for sub-Saharan Africa rises from 29.2% at a weighting of 0.25 to 45.1% at 1. All other regions decline, but to a lesser extent than for agriculture, probably because fewer modifiers were used.

Changing the weights for fisheries also favours sub-Saharan Africa, but not heavily. The redistribution across regions is much less pronounced.

#### 3.2.6.2. Weights changed one by one

TAC also explored the sensitivity of the results to changing the weight of a single modifier. For example, the analysis for agriculture was changed for each of the six modifiers receiving a weight of 2.00 while all others stayed at 0.5. The results showed that heavily weighting one of the modifiers can cause large (two- to threefold) changes in the priority shares allocated to some regions.

Together with other detailed analyses, the sensitivity analyses reported here helped TAC reach two conclusions on the assignment of weights. First, TAC firmly believes that all weights across modifiers should be equal. Second, given the sensitivity of the analysis to higher weights, TAC may decide to use a uniform weight across modifiers of 0.25 instead of 0.5.

### 3.2.7. Expected productivity gains

The productivity gain that can be expected is an important factor to take into account when setting CGIAR priorities by commodity. At TAC's request, the CGIAR centres provided estimates of the productivity gains they hope to achieve in each regional agro-ecological zone for their mandate commodities. In general, the estimated gains ranged from less than 1% (for unfavourable environments) to more than 3% (for favourable environments) per annum.

Table 3.6. Impact of Changing All Modifier Weights Equally: Regional Distribution for Agriculture, Forestry and Fisheries

| Region/<br>Production<br>Sector | Baseline<br>(%) | 0.25<br>(%) | 0.50<br>(%) | 1.00<br>(%) |
|---------------------------------|-----------------|-------------|-------------|-------------|
| <u>SSA</u>                      |                 |             |             |             |
| Agriculture                     | 18.9            | 26.5        | 34.1        | 47.2        |
| Forestry                        | 23.9            | 29.2        | 34.5        | 45.1        |
| Fisheries                       | 11.2            | 12.5        | 13.9        | 16.6        |
| <u>WANA</u>                     |                 |             |             |             |
| Agriculture                     | 6.7             | 7.4         | 8.2         | 9.2         |
| Forestry                        | 3.6             | 3.1         | 2.6         | 1.6         |
| Fisheries                       | 4.8             | 4.5         | 4.2         | 3.6         |
| <u>ASIA</u>                     |                 |             |             |             |
| Agriculture                     | 53.5            | 46.3        | 39.1        | 27.8        |
| Forestry                        | 45.0            | 43.0        | 41.1        | 37.1        |
| Fisheries                       | 65.4            | 64.9        | 64.4        | 63.3        |
| <u>LAC</u>                      |                 |             |             |             |
| Agriculture                     | 21.0            | 19.8        | 18.7        | 15.8        |
| Forestry                        | 27.5            | 24.7        | 21.9        | 16.2        |
| Fisheries                       | 18.5            | 18.0        | 17.5        | 16.4        |
| <u>TOTAL</u>                    | 100             | 100         | 100         | 100         |

For cereals, the expected productivity gains expected in most zones were 1-2% per annum. For roots and tubers in general they were less than 2% per annum, and in some zones less than 0.5% per annum. Estimates for cassava and sweet potato differed markedly depending on the centre concerned. For banana the gains expected in all zones were less than 1%, except in the humid tropics of sub-Saharan Africa, where they were 1-2% per annum. For grain legumes and oilseeds, estimates were generally 0.5-1% per annum or lower, except for cowpea and soybean in the subhumid zone and cowpea in the semi-arid zone, where gains of 1-3% per annum were expected. For livestock products, gains expected by ILCA were generally in the range 0.5-2% per annum, but those from ILRAD were generally 0.5-1% higher.

These estimates have to be considered with caution. The agro-ecological zonations used by the centres are generally different to those used by TAC, making the estimates problematic. The difficulty of disaggregating the progress made by the centres from that made by other actors such as national research institutes and extension services further complicates the estimating process.

### 3.2.8. ACIAR framework

TAC decided to seek additional inputs from an information system developed by ACIAR. The system consists of a multi-regional international trade model using the concept of economic surplus to derive ex-ante measures of the relative economic benefits of alternative commodity and regional research portfolios. A review of ACIAR commodity priorities by region reveals consistency with TAC's analysis in several major commodities. The major difference between both outcomes at the regional level relates to the relative ranking of livestock in sub-Saharan Africa and wheat research in West Asia-North Africa. ACIAR's results also suggest that, for all the developing countries taken together, commodities such as rice, potato and sweet potato appear to deserve more investment than the level suggested by the TAC analysis.

### 3.3. Strengthening National Research Systems and Information Services

The CGIAR began as a mechanism primarily for funding technological research, but as time passes increasing emphasis is being placed on collaboration with national systems in research and institution building. TAC believes a balanced approach to research and institution building to be appropriate.

TAC notes that the CGIAR system has provided training to large numbers of scientists from national systems (approximately 25,000 during 1985-89). TAC believes that the training programmes at the CGIAR centres need to change to take account of the progress made. Group training, especially production-oriented training, should be reduced in favour of individual postgraduate training and visiting scientist arrangements. Greater emphasis is needed on training in the areas of research management, fisheries, forestry, agroforestry, and the management of natural resources. In addition, advances in information technology will offer the CGIAR centres new opportunities to collect, analyze and disseminate research information.

TAC believes that institutional weaknesses still place major limitations on technology generation and adoption in the national systems of many countries. In the past the CGIAR centres have played important roles in institution building, including the organization of research networks, the provision of consulting services and the forging of institutional links. Furthermore, ISNAR provides a comprehensive integrated and systematic approach to strengthening national research systems. TAC believes that in future collaborative relationships between CGIAR centres and national research systems will increasingly augment the traditional institution building activities.



### 3.4. Research on Socio-economics, Public Policy and Public Management

The mission and goals of the CGIAR are unlikely to be achieved without a conducive policy environment. The lead CGIAR centre involved in research on these policy issues is IFPRI, but other centres, notably ISNAR and IIMI, also play a role. The CGIAR acts primarily as a catalyst in the field of food policy research. The main tasks are to understand the interactions between government action and human behaviour in relation to agriculture, technology, natural resources, and consumption, and to collaborate with national systems in identifying policy options.

The broadening of CGIAR goals to embrace self-reliance extends policy research to include cash crops as well as the reduction of staple food costs and the more efficient use of inputs. The role of international trade in providing food security is gaining in importance.

More policy research on sustainability issues is also needed. The role of policy in influencing human behaviour at the farm and community level will be a key component of multidisciplinary research on forestry and natural resources. Policy research can also play a role in securing stable funding for national research systems.

Continuing attention will be paid by the CGIAR to research on human linkages, particularly in relation to human nutrition and gender issues. More work is needed on the structures and processes by which research products reach and are utilized by rural producers and urban consumers.

The management of public organizations, such as national research agencies and irrigation management institutions, is another important topic for research in the CGIAR. Research on national research systems is needed to accumulate and analyze a knowledge base on these systems and to develop improved management concepts and tools.

## 4. Implications for CGIAR Priorities and Strategies

### 4.1. Introduction

Priority setting in the CGIAR is a complex multi-dimensional process which does not easily lend itself to a single analytical approach. The framework for priority setting developed and used by TAC has many advantages. It allows the introduction of modifiers to reflect the various goals of the CGIAR, and it requires TAC to recognize at every stage that increasing some activities means decreasing others. The framework also facilitates greater transparency in the priority setting process. However, there are also disadvantages, such as the possibility of introducing biases in the choice of modifiers and their weights, and the danger of relying too greatly on the numbers resulting from the spreadsheet analysis. Moreover, the spreadsheet analysis relates only to the allocation of priorities by region and agro-ecological zone, and by agricultural commodity. A different approach was used for the analysis of activities that are not commodity or regional specific. TAC therefore stresses the importance of taking into account the totality of its analysis, not just the spreadsheet analysis.

TAC has not yet completed its analysis of CGIAR priorities and future strategies. The Committee wishes to interact with stakeholders before finalizing its views.

In this section TAC presents its preliminary views on priorities by research activity category, and on the implications of the spreadsheet analysis for the distribution of resources across regions and production sectors, and across commodities within production sectors. Some outstanding issues are also addressed, including the link between CGIAR priorities and resource allocation; the consistency between the priority analysis and the analyses of the expansion of the CGIAR and the nature of ecoregional and global entities; and the need to review centre mandates in an expanded and restructured CGIAR.

#### 4.2. Priorities by Activity Category

CGIAR resource allocations across activity categories in 1989 were approximately: 15% on conservation and management of natural resources; 25% on germplasm enhancement and breeding; 35% on sustainable production systems; 5% on socio-economic, public policy and public management research; and 20% on strengthening national systems. This distribution need not necessarily provide the basis for future allocations across activity categories. Indeed, it will be altered by the recent addition of new institutions and subject matter areas to the CGIAR.

In all regions and zones, there was a perceived need for an expanded effort in research on the conservation and management of natural resources. TAC therefore suggests an increase in CGIAR efforts in this category from the current level of 15% to 20%, with particular attention to sub-Saharan Africa, West Asia-North Africa and Latin America and the Caribbean.

On germplasm enhancement, TAC's overall view is that the current level of allocation of 25% should be maintained, with greater emphasis on Asia, particularly for rice.

In the longer term national systems should be able to do most of the applied and adaptive research needed under the sustainable production systems category. TAC therefore suggests that the allocation to this category be reduced from 35% to 25% of the total in future.

There are strong indications that the need for socio-economic, public policy and public management research will become increasingly important in future. TAC therefore proposes that the CGIAR double its efforts in this category from 5% to 10% of the system's resources.

Regarding the strengthening of national systems, TAC's tentative conclusions are that training in the new areas of CGIAR activity, i.e. forestry, fisheries and resource management, will need to be increased, but that the overall emphasis on training should be reduced. Continued strong effort in training will, however, be required in sub-Saharan Africa, where institution building should also be emphasized. Information services is another area that should be strengthened to enhance partnerships with national systems. Thus the overall proportion of CGIAR activities devoted

to strengthening national systems would remain the same, but with less in training and more in institution building.

The overall tentative judgements on resource allocation by activity category are shown in Table 4.1.

#### 4.3. Relative Priorities by Agro-ecology

The analyses of priorities by agro-ecological zone and by regional agro-ecological zone show that with respect to the baseline for agriculture relative emphasis should increase in tropical agro-ecologies (AEZs 1-4) and in the cool subtropics with winter rainfall (AEZ 9). AEZs 1-4 were also considered the most important agro-ecologies for forestry, with a major effort required in sub-Saharan Africa. Priorities for the fisheries sector are not yet clearly defined.

TAC does not have information on the current allocation of CGIAR resources by agro-ecology. The proposed new allocations can therefore not be compared with existing allocations. However, based on its knowledge of current efforts TAC feels that the shifts implied in the analysis are already under way in the CGIAR system.

#### 4.4. Regional Priorities

In the 1986 TAC review of CGIAR priorities insufficient emphasis was placed on regional priorities. The Committee began the analysis at the global level then considered priorities among activities and commodities and only finally evaluated the regional implications. The current exercise began with regional agro-ecologies and therefore allowed a more comprehensive analysis of the regional distribution of CGIAR resources. The details of the regional analysis are given in Section 9.9.1.2. of the TAC working document and summarized in Table 4.2.

Using the three-point base (incorporating land use and the number of poor people, as well as the value of production) shifted the baseline value in favour of sub-Saharan Africa. Applying the modifiers and increasing their weights further shifted the emphasis towards sub-Saharan Africa and also towards West Asia-North Africa.

Having considered the implications of the analysis for regional balance very carefully, TAC concluded that any weighting greater than 0.5 would have a distorting effect. Further, the Committee felt that there were no compelling reasons for a further shift of CGIAR resources towards sub-Saharan Africa.

TAC seeks further inputs on the issue of regional balance, and commends it to the CGIAR as an item deserving full debate. The rapid population growth rates coupled with declining per caput food production in sub-Saharan Africa make a compelling case for that region. The fragility of its tropical agro-ecologies and the slow rate of progress in productivity improvement to date add to the apparent urgency. On the other hand, the magnitude of population numbers, the narrowing yield gap and the

Table 4.1. Priorities by Activity Category by Region

| Activity  | (System)<br>1989<br>Base | (System)<br>2010<br>Rec. | Region 1/ |      |      |     |
|---|--------------------------|--------------------------|-----------|------|------|-----|
|   |                          |                          | SSA       | WANA | Asia | LAC |
| 1. Conservation and Management of Natural Resources Including Germplasm Preservation (Biodiversity) | 15                       | 20                       | +         | +    | -    | +   |
| 2. Germplasm Enhancement and Breeding in Agriculture, Forestry and Fisheries                        | 25                       | 25                       | -         | -    | +    | 0   |
| 3. Sustainable Production Systems for Agriculture, Forestry and Fisheries                           | 35                       | 25                       | +         | 0    | -    | -   |
| 4. Socio-economic, Public Policy and Public Management Research                                     | 5                        | 10                       | 0         | -    | +    | +   |
| 5. Strengthening National Research Systems (Incl. Training, Information and Institution Building)   | 20                       | 20                       | +         | +    | -    | -   |
| TOTAL   | 100                      | 100                      |           |      |      |     |

1/ + = more than the new system level allocation

0 = equal to system level allocation

- = less than system level allocation but possibly higher than current allocation

Table 4.2. Impacts of Baseline and Modifiers of Regional Distribution of Values Relative to Current Allocation: Agriculture

|               | Baseline Components |                  |                | Baseline | Modified Baseline |      |      | Current (1989) Allocation |
|---------------|---------------------|------------------|----------------|----------|-------------------|------|------|---------------------------|
|               | V.O.P. %            | Number of Poor % | Useable Land % |          |                   |      |      |                           |
| Weight        | 0.33                | 0.33             | 0.33           |          | 0.25              | 0.5  | 1.0  |                           |
| <u>Region</u> |                     |                  |                |          |                   |      |      |                           |
| SSA           | 11.1                | 16.2             | 28.1           | 18.9     | 26.5              | 34.1 | 47.2 | 40.6                      |
| WANA          | 7.1                 | 5.4              | 12.3           | 6.7      | 7.4               | 8.2  | 9.2  | 12.9                      |
| ASIA          | 60.4                | 72.1             | 33.3           | 53.5     | 86.3              | 39.1 | 27.8 | 29.5                      |
| LAC           | 21.4                | 6.3              | 26.4           | 21.0     | 19.8              | 18.7 | 15.8 | 17.0                      |
| TOTAL         | 100                 | 100              | 100            | 100      | 100               | 100  | 100  | 100                       |

limited scope for land expansion all argue strongly for more long-term strategic and applied research in Asia. TAC's tentative position at present is that further transfers of resources to sub-Saharan Africa should occur only after a full debate has been held and further compelling reasons have been found.

#### 4.5. Relative Priorities by Production Sector

The analysis undertaken to date does not give much insight into the issue of the relative balance of CGIAR efforts between agriculture (crop and livestock), forestry and fisheries. This is so for several reasons. First, for valid analytical reasons different baselines were

chosen for agriculture, forestry and fisheries. The results of the modification analysis cannot therefore be added together. As a result one can compare relative distributions within sectors, but not across them. Second, forestry is a new initiative and CGIAR activities in fisheries have yet to be clearly defined. The current allocation of CGIAR resources cannot therefore be used as the starting point of the analysis. TAC's judgement is that the new programmes in forestry and fisheries should not be favoured at the expense of existing programmes for agriculture.

#### 4.6. Possible Scenarios for Changing Commodity Priorities

TAC has yet to reach final conclusions on commodity priorities, but has had a preliminary discussion which raised several important issues. It began its analysis by comparing the list of the top 27 agriculture commodities in developing countries with the current list of CGIAR commodities. First, TAC addressed the portfolio issue, asking whether there were any strong new candidates for inclusion in the CGIAR. It then reviewed current CGIAR commodities, particularly those with relatively low modified values of production but which are important for limited subsets of regions and for countries. This led to a discussion of whether any current commodity should be dropped. Lastly, TAC looked at the congruence between the modified values of production and current allocations to determine whether there was a need to consider altering the distribution of resources among commodities in the agricultural production sector.

##### 4.6.1. Results of the analysis

With respect to the portfolio issue, the analysis showed that 16 out of the 27 commodities listed were already in the CGIAR. It also confirmed TAC's earlier (1988) recommendation that vegetables (tomato, onion and cabbage) should be included in the CGIAR. Of the remaining 10 commodities, coffee, pig meat and cotton rank within the top 10 commodities. However, for the reasons stated in Sections 5.7. and 6.2. of the working document TAC's position on these and the other seven commodities (eggs, cocoa, poultry, sugar, tobacco, rubber and tea) is not to recommend their inclusion at this time. Coconut has a low modified ranking (0.9%), but may be recommended for CGIAR support because of its importance as a smallholder crop in agroforestry systems throughout the tropics.

Current CGIAR commodities with relatively low modified value of production included lentil (0.3%), pigeonpea, cowpea, chickpea (0.6%), phaseolus beans (1.3%), soybean (1.7%), sweet potato (1.4%), potato (1.4%), yam (1.3%) and pearl millet (1.4%). In 1986 TAC had recommended phasing out of faba bean and lentil.

##### 4.6.2. Scenarios considered by TAC

To determine whether there was a need to consider altering the relative distribution of resources among current CGIAR commodities, TAC examined the results of its modified congruence analysis. The criteria used included: current level of resource allocation relative to the outcome of the spreadsheet analysis; low base weight; importance of the commodity (whether global, regional or in one or two countries only); and

strength of national research programmes. If a commodity is principally grown only in one or two countries, and if the countries concerned have relatively strong national research systems, TAC will seriously consider a reduced emphasis for the CGIAR. Likewise, if the base weight of the commodity is low there would have to be strong reasons for increased CGIAR effort. It was felt that the relative allocation to any commodity or group of commodities should normally not exceed its relative ranking in the congruence analysis unless a higher allocation were necessary to ensure a minimum critical mass.

#### 4.6.3. Implications of scenarios

The modified values of groups of commodities for all developing regions combined were: cereals 37.4%, roots and tubers 14.1%, food legumes 7.5%, banana and plantain 13% and livestock 28%. These figures compare with 1990 core resource allocations of cereals 50%, roots and tubers 11.3%, food legumes 12%, banana and plantain 0.7% and livestock 27%.

If congruence analysis were to be strictly applied, divergences between modified values and actual allocations could be used to raise the issue of whether CGIAR resources should be reallocated from cereals and food legumes towards roots and tubers and bananas. TAC's view was that only large divergences should be explored further.

In view of the strength of national research systems and the progress made by the centres concerned on phaseolus beans in Latin America and the Caribbean, and on chickpea and pigeonpea in India, TAC discussed the possibility of reducing the emphasis on these three commodities. Phaseolus beans are mainly produced in Brazil and Mexico, and over 80% of the world's production of pigeonpea and chickpea is grown in India. Brazil, India and Mexico are considered to have relatively strong national programmes. TAC will return to this discussion as it completes its final recommendations. It nevertheless felt that current efforts in West Asia-North Africa on chickpea and in sub-Saharan Africa on pigeonpea and phaseolus beans should probably be maintained because of the importance of Ascochyta blight in the former, and the weakness of national programmes in the latter.

Cowpea is largely produced in Nigeria, and could be an important commodity throughout West Africa, where national systems are still weak. TAC concluded that it would therefore be appropriate to continue CGIAR support in the short to medium term.

TAC noted that soybean ranked above several other legumes. The Committee still feels that soybean has substantial potential in developing countries.

Yam, potato and sweet potato were not in the top 20 commodities in the modified list. In its 1986 review of priorities, TAC recommended the continuation of efforts on yam in the short term, followed by a performance review in five years. The assessment of the Third External Review of IITA (TAC/CGIAR 1990) was that the comparative advantage in yam improvement lay with the Nigerian national research system, and that IITA should concentrate on germplasm conservation and on the critical constraints to germplasm improvement. TAC endorses this view, and suggests that a review

of the effectiveness of CGIAR research on yam should be part of the next external review of IITA, which has the global mandate for this commodity.

Potato fell in the modified ranking, mainly because it is predominantly grown in the subtropics and cool tropics. National systems in these agro-ecologies are relatively strong. A case could therefore be made for reducing the emphasis on potato in some regions. TAC notes that CIP has already started to de-emphasize research on potato in its long-term strategy.

Over 80% of the global production of sweet potato is in China (which has a relatively strong national research system). Further, there has been a steady decline in the importance of sweet potato as a food staple, and shifts in product utilization have occurred, largely in Asia. TAC wishes to consider further the level of CGIAR support for sweet potato.

Pearl millet is an important crop in sub-Saharan Africa, where approximately half of the world's production is found. In Asia, millet is mainly produced in India. In 1986 TAC recommended a shift of effort towards sub-Saharan Africa, to which ICRISAT responded positively. The assessment of the Third External Review of ICRISAT (TAC/CGIAR 1991) was that most applied and, in due course, strategic research of interest predominantly to India should be transferred to the national programme. TAC endorsed this view.

In 1986 TAC recommended a relative reduction in the emphasis given to rice from its then level of 25% of commodity research expenditure. TAC based its recommendation both on the apparent over-emphasis on the commodity relative to its importance in global food supplies and on the strength of national programmes in Asia. For a variety of reasons well known in the CGIAR, the relative funding for rice has not declined. However, the analysis just completed seems to support the recommendation of the 1986 TAC review.

The Committee considered again its earlier recommendation to reduce the relative allocation to rice, particularly in Asia where national programmes have grown stronger. In West Africa, rice consumption continues to rise rapidly as a component in diets, substituting for traditional staple cereals and roots and tubers, especially in urban areas. Further, weaker national programmes and higher research costs make African research in general more expensive than research elsewhere. Given the CGIAR decision to have a major upland rice improvement effort in Africa, TAC, two years ago recommended funding at a critical minimum level which gave the research programme a reasonable chance of success. Thus, the issue remains complex. TAC currently is mounting an inter-centre review of rice in the CGIAR in conjunction with external reviews of IRRI and WARDA. TAC therefore will continue to consider the relative distribution of resources to rice.

Finally, TAC noted that while the congruence on livestock research appears close globally, there remain major questions about activity, regional and species emphasis. When the livestock study currently being undertaken by Winrock International is completed and the next reviews of ILRAD and ILCA are finalized, TAC will revisit livestock research priorities as it agreed to do to allow a final decision on ITC. Given these two major issues - rice and livestock - TAC will have to further



consider the relative distribution of efforts among cereals and between major commodity groups.

#### 4.7. Concluding Remarks

While TAC has not yet finalized its priority recommendations, some general propositions are emerging. The approach taken by TAC to this priority analysis is more comprehensive and more quantitative than previous TAC efforts. TAC has attempted to bring into the analysis quantitative indicators of the most important dimensions of the CGIAR mission and goals. It has also carefully reviewed the outputs of similar efforts such as that of ACIAR. A major conclusion arising from TAC's analysis is that the current constellation of CGIAR activities is highly congruent with present and future research and research-related needs.

The challenges facing the CGIAR at its birth have intensified. Population growth continues at high rates, particularly in Africa, poverty and malnutrition remain pervasive, the need for increased productivity grows more acute as the opportunities for area expansion diminish, and long-term issues of sustainability have become both more prominent and more severe. Thus TAC finds that applied and strategic research at the international level focused on productivity improvement and sustainable resource management for agriculture, forestry and fisheries, is needed more now than it was in 1970. Despite a broadening commodity portfolio and additional interests in natural resource management, the CGIAR remains a highly focused organization. The system still devotes critically necessary levels of resources to selected commodities of major importance, and still focuses on a set of research activities that are most efficiently and effectively conducted internationally.

Thus the tentative conclusion that no major changes in activities, regional emphasis and commodity portfolios should be made, should be seen as a strength of the CGIAR. The Group and all its components have always been futuristic and devoted to attacking emerging issues of importance. The CGIAR in 1991 is both similar and different from the innovative model created in 1971. It is similar in its commitment to improving the lot of the poor in developing countries by increasing their access to an affordable and sustainable food supply. It is different in its scale, breadth of activities, and emerging partnerships with developing countries. The challenge ahead remains enormous.

#### 4.8. Outstanding Issues

##### 4.8.1. Links to resource allocation process

The CGIAR has requested TAC to develop a mechanism for linking the resource allocation process to the System's overall priorities. It has also cautioned TAC to be aware of potential funding constraints. The request arose out of the 1989-90 review of experiences with the new resource allocation process, which highlighted the growing imbalance between perceived research needs and the availability of funds. The aim is to use the priority setting framework to set potential funding targets for CGIAR centres.

The spreadsheet framework used by TAC in the current analysis of priorities is largely mechanical and does not handle activities that are not commodity- or region-specific. It can therefore provide only a partial input into the linkage mechanism. TAC intends to develop a more aggregate and institution-oriented approach which will draw on the totality of the priority assessment exercises, including TAC's collective judgement and the institutional strengths and strategic plans of the centres. With this caveat, TAC remains convinced that the translation of priorities into institutional resource allocation targets is feasible.

#### 4.8.2. Potential funding constraints

Recommendations on CGIAR priorities can be made only in relative terms. Consequently it will become necessary to have a clear notion of the level of funding before TAC can convert relative priorities into actual proposed allocations. TAC urgently needs some guidance from the CGIAR on this matter.

#### 4.8.3. Consistency with TAC's medium- and long-term visions

In the expansion report (TAC/CGIAR, 1990) TAC used its analysis of the long-term food trends and research needs by region and sector to assess the subject matter areas represented by the so-called non-associated centres. TAC had also completed a major study of research needs in forestry and agroforestry as part of the expansion report. The priorities identified in the earlier exercise for the management of natural resources, forestry and agroforestry have been reconfirmed in the current review of CGIAR priorities. The research needs identified by agro-ecological zones and regions in the current review also conform with the earlier findings.

It can therefore be concluded that there is a large degree of consistency between the current and the earlier TAC projections of long-term priorities. The need for more focused efforts on sustainable production systems and on productivity improvement has also been stressed by the current review of priorities. This lends support to TAC's notions of ecoregional and global mechanisms contained in the Expansion Report.

#### 4.8.4. Implications for TAC's analysis of priorities and the expansion analysis for centre mandates and the future structure of the CGIAR

If TAC's tentative conclusions on priorities are confirmed, the major remaining outstanding issue for the CGIAR to grapple with is what are the strategic and structural implications of its analysis for centre mandates and the structure of the CGIAR. In Chapter 11 of the expansion report TAC presented preliminary thoughts on these matters as a series of principles and some tentative scenarios for future structure. In that analysis TAC favoured a pragmatic approach, intermediate between a clean slate approach and the minimal changes necessary to accommodate TAC's recommendations on the admission of selected new subject matters and institutions. Much has happened since that chapter was completed. The CGIAR has taken its decisions on TAC's recommendations. Some were accepted, others were modified and in forestry a quite different

institutional mode was adopted. Some centres, particularly CIAT, have responded to TAC's notions of ecoregional mechanisms by proposing significant modifications in their strategic plans. The funding outlook has not brightened. Finally, the form and magnitude of CGIAR efforts in forestry, agroforestry and fisheries have yet to be fully fleshed out.

In the current exercise, TAC has not yet fully debated future strategies and structure. It has not done so for two reasons. The first one is obviously time. The second and more important reason is that the CGIAR has yet to express itself on how it wishes to proceed in this matter. Clearly TAC is prepared to provide its insights, but the Committee is of the view that the issues of future structure transcends its normal mandate. As stated in the preceding section, TAC remains convinced that a CGIAR with two primary institutional forms - ecoregional and global mechanisms - is a feasible way of rationalizing the CGIAR as it approaches the 21st century. Movement in that direction would require adjustments in the mandates of many of the existing CGIAR centres and would require the explicit consideration of how ecoregional research needs would be addressed, particularly in Eastern and southern Africa and in Asia. Clearly, the future structure and magnitude of the CGIAR will be heavily influenced by issues of fund availability, governance needs and institutional forms. Ultimately, adjustments will be determined by the considered decisions of donors, Centre Boards and management, together with our partners, the national programmes.

#### 4.8.5. Next steps

TAC will continue its discussion of priorities and strategies, the linkage with the resource allocation process, and structural implications at its 56th Meeting in October 1991. As already indicated it plans to continue its interactions with national research systems, Centre Directors and Board Chairs. It looks forward to the CGIAR discussion at ICW'91 at which time TAC will report on further progress in its deliberations and interactions with national research systems. With these further inputs TAC will finalize its review of CGIAR priorities in March 1992 and present it to the CGIAR in time for the Mid-Term Meeting in May 1992.