RESEARCH AND EDUCATION SUPPORT SYSTEMS FOR AGRICULTURAL DEVELOPMENT IN THE CARICOM REGION

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ABSTRACT

The importance of national physical and cultural characteristics in the formulation of a Research and Education Support System (RESS) is restated and the physical and cultural characteristics of the Caricom farming community briefly described.

The purposes of RESS's interrelationships between fusion of science and technology versus institutional integration of research and education for agricultural development in the 20th century are discussed. Structural features of RESS in Caricom are evaluated in the light of these discussions.

Current, fragmented management of support systems for agricultural development in Caricom are examined and an alternative framework for integrated management of the RESS proposed. The framework is based on fusion of the publicly funded national and regional institutions of agricultural research with national institutions of formal (schools of agriculture) and non-formal (extension services) education.

It is perceived that the major problems in implementing the alternative framework at national and regional levels are conceptual. At national level, the problems revolve around convincing national governments of the efficacy of integrating institutions of research and education for accelerated agricultural development. The regional problems emerge from difficulty in accepting the notion that a regional institution of research can be effectively replaced by a regional system for management (mandating, networking and evaluation) of regional projects in national institutions, albeit at reduced costs.

INTRODUCTION

In his book on Agricultural Research Policy, Vernon Ruttan proposed that:

> "the capacity to develop and to manage technology in a manner consistent with a nation's physical and cultural endowments is the single most important accounting for differences in agricultural productivity among nations."

Ruttan (1982) went on the state that development of such capacity depended on the formulation of appropriate institutions of:

(a) Research and Education, i.e.

> "capacity to organize and to sustain the institutions that generate and transmit technological knowledge" [and their output] "the level of husbandry skill and educational

accomplishment of rural people."

(b) Technology Development and Manufacturing, i.e.
"ability to embody new technology in equipment and materials."

(c) Commerce and Marketing, i.e.
"the efficiency of input and product markets."

(d) Socio-political Management, i.e.
"the effectiveness of social and political institutions".

These statements emphasize that important though it is, the Research and Education Support System (RESS) is only one of the many that determine the course of agricultural development. Also, the importance of national physical and cultural endowments in the formulation of appropriate institutions of agricultural development, particularly those of research and education, is fully supported.

The commanding characteristics of the physical endowments of the Caricom Region include:

- small size of some 13 states
- limited availability of arable land
- concentration of a high proportion of arable lands in large farms
- small size, poor lands and large number of the typical farm.

For purposes of this paper, I propose that the important cultural endowments of the agricultural sector in the Region derive from the dichotomy of interests between small farmers versus large farmers and agricultural entrepreneurs. The cultural imperative of some 300,000 small farmers is the achievement of socio-economic mobility in the society for themselves, but particularly for their children, through maximization of educational opportunities. Having already achieved socio-economic mobility, the major cultural characteristic of the large farmer/entrepreneur is to maintain this status through further capital formation.

Despite a commendable effort, Ruttan (1982) not only failed fully to explore the complimentarity between research and education, but also omitted to record the important role of public sector research in safeguarding the interests of society as a whole (Bowman, 1983); particularly in the fragmented societies in developing countries.

In this paper, I propose to examine the appropriateness of the RESS in the Caricom Region with particular reference to national and regional institutions of agricultural research and technical education under the following headings:

- Purposes of RESS for Agricultural Development
- Integration versus Fragmentation of RESS
- Management of Support Systems for Agricultural Development
- Alternative Framework for Management of RESS
- Problems in Implementing the Alternative Framework.

PURPOSES OF THE RESS FOR AGRICULTURAL DEVELOPMENT

The 20th century heralded an era in which progress in agriculture depends on the efficient application of the principles of science and technology to production, distribution, marketing and consumption of agricultural commodities. This change has made both the definition of the purposes of institutions of agricultural research and education and their interaction with other components of the agricultural sector, critical for agricultural development. Definition, explanation

and edvocacy of these purposes are particularly important in developing countries, where these institutions need to mobilize a considerably greater percentage of the public resources than currently obtains. Such mobilization is critical if those research and educational programmes, which are preconditions to agricultural development are to be completed. This responsibility falls firmly with the scientific community.

The general purposed of the RESS are:

1. provision of a continuous supply of trained manpower, statistics and analysed information and new and improved technologies in support of defined programmes of agricultural development;
2. provision of advice to policy-makers, planners and managers on strategies based on scienfitic analysis, for achieving the objectives of agricultural development programmes;
3. facilitation of the adoption of technological change in society by raising the level of consciousness of the population in general and the productive sector in particular, on issues pertaining to sustainable production, distribution and utilization of agricultural commodities.

It is well known by those who are engaged in both functions, that there is a great deal of complementarity between the operations involved in research and education. Thus, end users the objects of education programmes, are the major source of research problems in the productive system. Research ideas are very often conceived in the process of communicative exchange with students, extension workers and farmers. Moreover, postgraduate students are major contributors in the conduct of research projects. Also, teachers and trainers need the stimulus of involvement in the generation of new technology, in order properly to communicate both existing and new technology to students, extension workers and farmers.

Conceptually, efficient management seems to dictate that there should be some organic linkage between research, which provides outputs of knowledge, information and technology and education, which disseminates these outputs to users. That is to say, the major purpose of research is to provide outputs for use in education, particularly the education of end users - the farmers and marketeers. It is here proposed that the most effective organic linkage between research and education is the conduct of both functions by all scientists in the RESS, e.g. research and teaching or formal education or research and extension or non-formal education. Nevertheless, the specific processes and purposes involved in research and education are sufficiently different as to require separate definition.

Bowman (1983) described four specific purposes of agricultural research as follows:

1. to improve the return on resources used in existing methods of production, processing, distribution, marketing and consumption;
2. to make the existing methods of production more acceptable on social and moral grounds;
3. to make the final product more acceptable to the consumer in quality and price;
4. to facilitate change in existing processes to meet future needs and opportunities (inter alia through generation of new technology).

The significant feature of these purposes is that the first three refer to improvement of existing methods and hence demand a thorough

knowledge of the agricultural sector. Only in purpose No.4, is technological innovation provided for, and then, the researcher is vested with the responsibility of facilitating adoption of such innovative change in the agricultural sector, i.e. an educational function.

If we accept this view of the purposes of agricultural research, then four complimentary specific purposes of agricultural education will include:

1. to train personnel in the principles and practice of management for operation at all levels and in all institutions and enterprises in the agricultural sector;
2. to train personnel in the principles and practice of all the component operations in production technology;
3. to train personnel in the principles and practice of all component operations in consumption technology;
4. to facilitate implementation of improvements and innovations in the agricultural sector, through regular analytical commentary and discussion on them with students, extensionists and end users in the agricultural sector.

Because of the complexity of science-induced agricultural technology, achievement of the general and specific purposes of the RESS for agricultural development requires an intricate system of communication and interaction between all sources of knowledge, information, technology and services. Moreover, as the most powerful source of these outputs, components of the RESS must not only be well coordinated, if not integrated with each other, but must also develop clear communicative mechanisms with management and other support systems, e.g. planning and services as well as with the productive components of the agricultural sector.

In the succeeding sections, both the genesis of the integration of agricultural research and education and the interaction of the RESS with other components of the agricultural sector will be explored.

INTEGRATION VERSUS FRAGMENTATION OF RESEARCH AND EDUCATION SUPPORT SYSTEMS

After some 5800 years of craft-based technology, e.g. the plough, the ancient Greeks invented science from the elements of Arabian and Babylonian technology by 200 BC. But science remained virtually separate from technology for some 2100 years thereafter. It was the industrial revolution in 19th century Europe which saw the beginnings of the fusion of science and technology, leading to the replacement of craft-based by science-based technology, both in industry and in agriculture. The change lead to the introduction of the laboratory-based sciences of biology, chemistry and physics into the classical university education curriculum in the theology, law and medicine in Germany in 1809.

The modern research university which resulted was the invention of the German scientists Justus Von Liebig and Wilhelm Humbolt; but at first, agriculture was excluded from the new universities to be taught in agricultural academies or colleges. These academies conducted no research and hence, in its conception, agricultural education was separated from agricultural research. Strong advocacy for agricultural research by Von Liebig led to the establishment of the first publicly-funded agricultural experiment station, designed to address the

location-specific problems of farmers in Saxony in 1852. This socialization of agricultural research separate from agricultural education was again strongly criticized by Von Liebig and subsequently, his advocacy led to integrated introduction of agricultural research and education in several German universities over the period 1863 to 1880.

It was during this period that the integration of research in the agricultural experiment station, with higher agricultural education in the US Land Grant State University System was realized by the 1862 Morrill Act. The educational components of the system included practical training in agriculture, science, technology and, not only in the capacity to instruct others but also the responsibility for so instructing farmers (extension) in production technology. However, it was only with the passage of the Hatch Act in 1887, which provided federal funding for research in Land Grant Experiment Stations, that their capacity for research and agricultural development was fully realized.

Some 12 years after the Hatch Act in 1899, the first publicly-funded agricultural experiment station was founded at Rothamsted in England, separate both from the university system as well as from the farmer advisory service. This system immediately became the model for institutions of agricultural research and education in the British colonies. Some 100 years after the Morrill Act in 1967, Sir Eric Ashby (later Lord Ashby), the distinguished British botanist and educator described the dismantling of the walls around the university in the US Land Grant University System as:

"the great American contribution to Higher Education" and

"one of the rare innovations in the evolution of universities."

Despite Ashby's strong advocacy, the fragmentation of institutions of agricultural research and education persists in the Caricom region some 24 years after independence of Jamaica and Trinidad and Tobago in 1962.

Before examining the fragmentation, two other systems of integrated research and education are worthy of note. Thus, in India, such integration is institutionalized in the State agricultural universities and federal coordination effected by a national council which also controls specialized research institutes. In Scotland, integration of technical, paraprofessional agricultural training, extension and applied research is realized in technical agricultural colleges, basic research and professional education conducted in universities and specialized research, e.g. plant breeding carried out in research institutes.

In contrast, the Caricom region is characterized by extreme fragmentation of regional and national institutions of agricultural research and education as shown in Tables 1 and 2. This fragmentation severely limits the capacity of the education and research support system to interact with both the national policy, planning and management system as well as with the productive system to effect agricultural development.

In the course of the 20th century, the rate of generation of science-based technology has increased at a rapid rate, leading to the technological revolution which we are now experiencing. In agriculture, the Green Revolution in cereal production in the 1950's and 1960's and subsequently the capacity for industrial conversion of maize starch into high fructose syrup in the US have virtually

TABLE I: Regional Institutions of Agricultural Education and Research in the Caricom Region

Institutions of Education of Research:	
UWI, Faculty of Agriculture (St. Augustine, Mona)	
UWI, Faculty of Natural Science (Mona, St. Augustine, Cave Hill)	
Institutions of Education:	
Formal:	
REPAHA (Guyana)	
Non-Formal:	
UWI Caribbean Agricultural Extension Project (CAEP)	
Institutions of Research:	
CARDI	W.I. Central Cane Breeding Station
WINBAN	Caribbean Development Bank
CARDATS	Caricom Secretariat
UWI Cocoa Research Unit	Caribbean Food Corporation

TABLE 2: National Institutions of Agricultural Education and Research in the Caricom Region

Institutions of Education:
Formal:
ECIAF
Univeristy of Guyana/GSA
College of Agriculture (Jamaica)
Belize School of Agriculture
Non Formal:
MINAG Extension Divisions
Commodity Research Institute Extension Units
Agricultural Societies
Farmers' Groups
Institutions of Research and Development:
MINAG Research Divisions
Commodity Research Institutes (e.g. Sugar)
Commodity Boards (e.g. Bananas, Coconuts, Cocoa, Rice)
Industrial Research Institutes:
CARIRI (Trinidad)
SRC (Jamaica)
Corporations:
ADC (Jamaica)
FAC (Trinidad).

destroyed the prospects for the Caricom sugar industry in its current form. This example demonstrates the manifest benefits of an efficient and integrated research and education support system for rapid generation, dissemination and absorption of new and more productive

agricultural technology. It also demonstrates the induction effect of the adoption of new agricultural technology on the realization of innovative industrial technology. Such benefits will be even more apparent in the 21st century with the realization of advances in biotechnology.

Meanwhile, continuous adjustments in the English system, including the association of agricultural research institutes with university Botany Departments, are still a progress in an attempt to achieve an acceptable integration of agricultural education and research. In the Caricom region, proposed adjustments to the system have not been implemented despite the existence of several official reports, e.g.:

1. December 1976 - Jamaica Agricultural Research. Reorganisation, Research Programming and Strategy of Implementation by FAO/IDB Co-operative Programme.
2. October 1977 - Trinidad and Tobago White Paper on the National Institute of Higher Education (Research, Science and Technology).
3. December 1979 - Baseline Study of Agricultural Research, Education and Extension in Jamaica by the University of Kentucky.
4. September 1983 - Final Report. Agricultural Research Project. Jamaica by Multinational Agribusiness Systems Incorporated.

Several papers have also been written, e.g. Spence, 1980; Wilson, 1984, 1985a, 1985b and conferences convened on the subject.

MANAGEMENT OF SUPPORT SYSTEMS FOR AGRICULTURAL DEVELOPMENT

The major components of the process of national management of the agricultural sector in CARICOM Governments are: Top Management, Middle Management, and The Production/Marketing Subsector.

Top management is considered to be the Minister, Permanent Secretary and Chief Agricultural Officer in the Ministry of Agriculture. Middle management is, here, defined as the County Extension Officers and Project Managers of Development Projects. The production/marketing subsector includes the private and public sector farmers and marketeers in the agricultural sector. Moreover, the major function of national management for agricultural development is, here, considered to be the facilitation of continuous and sustained improvements in production, trade and consumption among farmers, marketeers and consumers, to the mutual benefit of all parties. Such management should normally be conducted in two phases of planning and implementation.

National management cannot hope to achieve the above-mentioned function without the services of extensive support systems, both within and outside the Ministry of Agriculture (MINAG). Within MINAGs, there are usually support systems for planning, education, research and regulatory and advisory services. Outside MINAGs, support systems for production inputs and commercial finance from the private sector and infrastructural inputs and subsidies, price support and development finance from the public sector are often provided. The institutions involved in support systems including:

Planning, e.g. Planning Units

Formal and Non-Formal Education, e.g. Schools and Extension Divisions
Socio-Economic and Technological Research, e.g. Research Institutes
Input and Infrastructural Services, e.g. Commercial Houses, Ministry of Works are located for the most part in MINAGs (Table 3).

TABLE 3: Institutions in Support Systems for Agricultural Development

Planning Support System (PSS)
- Planning units

Education Support System (ESS)
Formal:
- Colleges/Schools of Agriculture
- UWI, Faculty of Agriculture

Non-Formal:
- Extension Divisions (MINAG, Commodity Research)

Research Support Systems (RSS)
- Research Institutes (MINAG, Commodity, etc.)
- CARDI
- UWI, Faculty of Agriculture
- Extension Division (Technology Evaluation)

Services Support System
- Commercial Houses and Banks
- Ministry of Works, Development Banks, Marketing Agencies
- MINAG Development Project Office
- Extension Division (Subsidies, etc.)

One of the revealing features of these support systems is the expectation that the often understaffed Extension Division should function in non-formal education, research at farm level and service (subsidies, etc.) support systems.

If the unit socio-economic component of national agricultural development is conceived to be the Agricultural Development Programme (ADP), then formulation of the individual costed projects which comprise such a programme (i.e. the planning phase) is the result of interaction between top and middle management with the various support systems (Fig. 1). Thus, the Planning Support System should interact with top and middle management, with defined inputs from education, research and service support systems to produce the compendium of the costed projects involved in the ADP. The defined inputs include knowledge, information and statistics on trained manpower and farmer skills; farm performance and available technology as well as production inputs, finance, subsidies and physical infrastructure, e.g. roads, water, etc. Unfortunately, to the detriment of many an ADP, these inputs are often never sought and, when sought, are frequently not available. In such cases, policy and plans are passed from top management to middle management for execution, with the benefit, neither of inputs from the support systems nor indeed of the compendium of costed projects which such inputs should generate.

Similarly, the implementation of individual projects in an ADP

requires close coordination between middle management, regulatory and educational extension services, infrastructural and input service, and the production, marketing and consumption subsectors (Fig. 2). A major shortcoming of the system as it operates in the Region is the assignment of regulatory and educational functions to the same extension officers, with the result that technology transfer suffers in the face of the overwhelming burden in the administration of subsidies, etc. (FAO/IDB, 1976). Moreover, little attention is given to extension work in postharvest technology, marketing and consumption.

The description of the components and perceived shortcomings of a hypothetical ADP is here recorded to indicate that the major mandate of top and middle management in MINAGs is the management of such programmes. MINAGs are provided neither with the staffing nor the expertise to cooordinate and to manage the affairs of Research and Education Support Systems (RESS). Moreover, many of the component institutions in these systems are located outside MINAGs, e.g. commodity research institutes, commodity boards, schools of agriculture. As a result, RESSs are weak, uncoordinated and unable to provide inputs on a timely basis for ADP planning and execution.

Therefore, it is concluded that an alternative framework is needed for the operation, management and coordination of RESSs to realize the complimentarities which can be derived from integrated management of these systems mentioned earlier, as well as to secure their invaluable inputs for ADP planning.

AN ALTERNATIVE FRAMEWORK FOR MANAGEMENT OF THE RESEARCH AND EDUCATION SUPPORT SYSTEM

In the design of an alternative Research and Education Support System for the CARICOM Region, three critical objectives must be taken into consideration as follows:

1. acceleration of the transformation of domestic agriculture from craft-based to science-based technology through agricultural research.
2. accelerated education of some 300,000 small farmers in science-based agricultural technology.
3. transformation of export agriculture into crop enterprises which are profitable and competitive on the world market.

It is perceived that the education of small farmers is the most important objective of the alternative system, not only because of their overwhelming contribution to such national food security as exists, but because of their increasing involvement in export agriculture. Moreover, new knowledge and technology for the education programme must be transmitted to farmers and marketeers as soon possible after their discovery and formulation, in research and development programmes respectively. The overriding characteristics of an alternative system for achieving these objectives include:

1. strengthened national and sub-regional research and education systems.
2. integrated management of research and education support systems.
3. regional networking of national institutions and projects.

Strengthened National and Sub-Regional Systems:

On the basis of geographical and political considerations, six

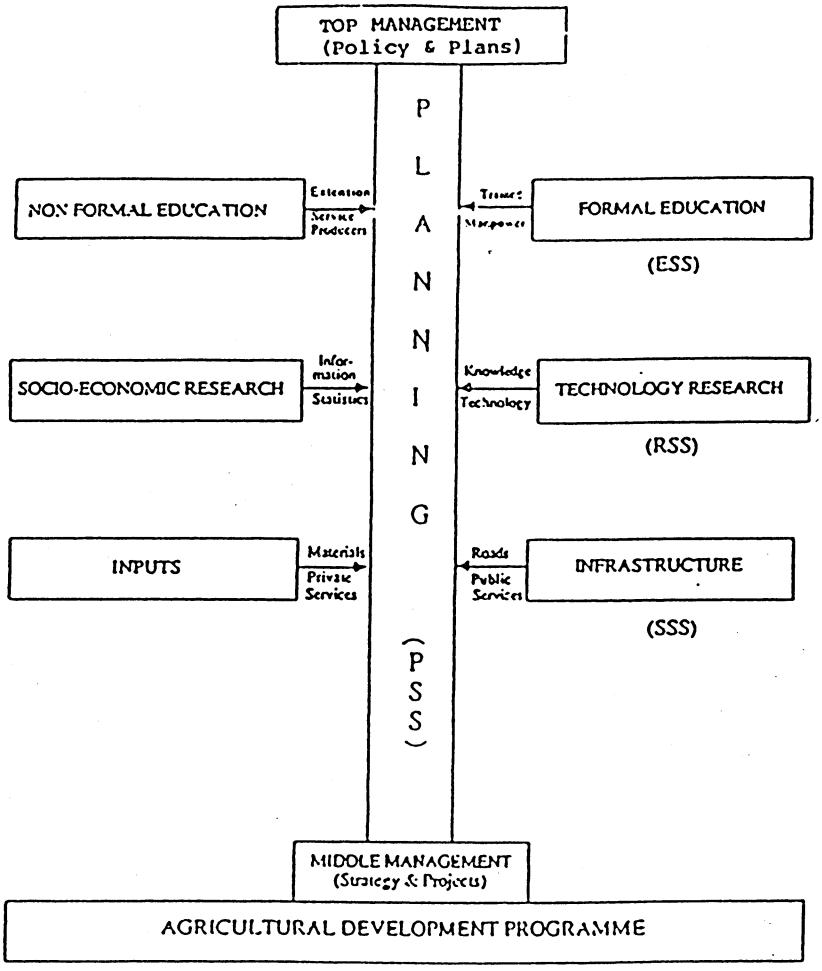


Fig. 1: Inputs from Support Systems for the Planning of a Development Programme

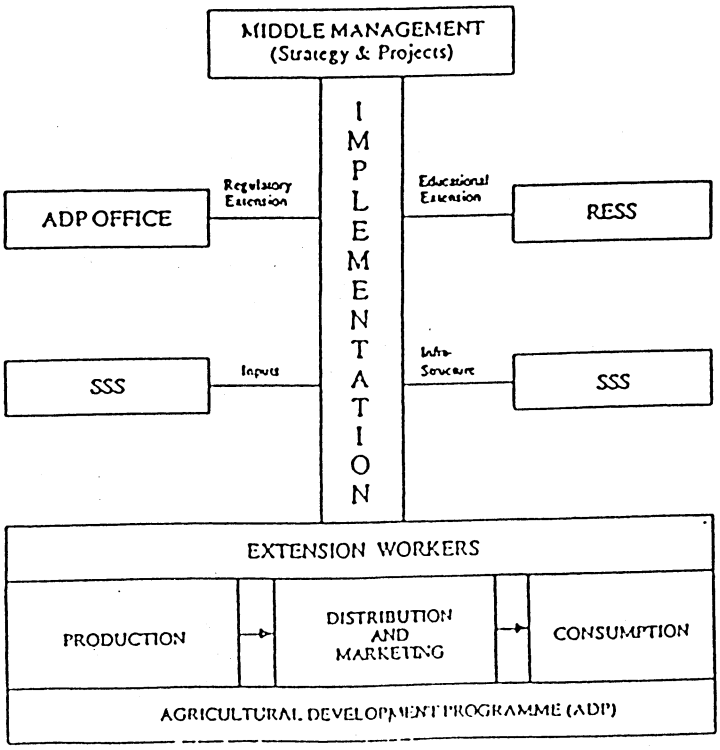


Fig.2: Inputs from Support Systems for the Implementation of an Agricultural Development Programme

national and subregional units are recognised for consideration of Research and Education Support Systems as follows:

Belize	Barbados	Guyana
Jamaica	Eastern Caribbean States	Trinidad & Tobago

There are major institutions of agricultural research and education in each of these units, but the resulting national or subregional system is weakened because of institutional fragmentation grounded in the evolution of the constituent institutions since 1899. The major features of this fragmentation are:

1. separate management of research institutions
2. separation of institutions of research and education.

In Jamaica, where the fragmentation of research institutes is most acute, because of their greater number, this source of structural weakness has already been recognised in several international studies and proposals for strengthening the system made. However, surprisingly, no report has, as yet, recognised the inherent weakness in separation of agricultural research from both formal and non-formal agricultural education, despite several examples of the demonstrable advantages of integrating these functions, e.g. in the US, Japan and India, as explained earlier.The same system exists at different levels of fragmentation in the other five Caricom units. This fragmentation has resulted not only in chronic and persistently weakened national research capacity, but also in reduced national capacity for both formal and non-formal agricultural education.

Therefore, the major strategies for strengthening the existing Research and Education Support System include:

1. integrated management of institutions of research and education
2. integration of the functions of research with those of formal and non-formal education.

It is expected that the complimentarities which would be derived from integration would strengthen both functions.

Integrated Management:

Integrated management of an institution of research and education is, here, intepreted to mean that there is one Managing Director responsible to a competent Board of Management with the following areas of competence:

Enunciation of policy
Allocation of resources
Evaluation of institute and management performance
Staff assessment and promotion.

On the basis of this definition, integrated management exists in the following CARICOM institutions of agricultural research and education.

1. The UWI Faculty of Agriculture - for research, formal education and an extension and advisory service
2. Commodity Research Institutes - for research and non-formal education (extension)
3. Some Commodity Boards - for research and extension (and trade)

But in publicly supported national and regional research and education systems, little, if any, integrated management exists. Accordingly, there are separately administered institutions in Government Ministries, e.g.:

2. Extension Divisions in MINAGs
3. School of Agriculture in MINAGs, e.g. in Trinidad and Tobago.

Moreover, in some states, Colleges or Schools of Agriculture are separately administered and/or managed in Ministries of Education, e.g. in Belize, Guyana and Jamaica.

The disadvantages of this fragementation include:

1. Poor communication between researchers, trainers and producers.
2. Slow transfer of knowledge, information and technology from researchers to trainers, extensionists and technology users.
3. Weakened and duplicated research programmes.
4. Weakened training programmers because of 1 and 2 above.
5. Increased costs of research and education programmes.

I can identify no advantage for the fragmented system, except the exclusive focus of researchers and extensionists on a single commodity in commodity research institutes. However, such focus can also be achieved in integrated management by commodity programming.

Integrated management of national Research and Education Systems cannot be achieved overnight. It may be programmed in two distinct stages as follows:

1. Coordinated management of existing institutions.
2. Integrated management of the system as a single institute.

In Coordinated Management of existing institutions, all institutions of agricultural research and education will fall under either the budgetary or supervisory management of a National Agricultural Research, Training and Development Council (NARTDEC). Such a Council will include directors of individual institutions, representatives of MINAG top management, independent members, e.g. farmers, marketeers, enterpreneurs and agricultural society representatives and should be constituted by Parliament on the advice of MINAG and Cabinet. NARTDEC should elect its own Chairman who should, however, be acceptable to MINAG.

NARTDEC should have four functions as follows:

1. The Council should be assigned the function of management of all budgetary allocations to publicly-funded national institutions of research and education and in this respect will function as a Management Council or Board.
2. NARTDEC should also function as a Supervisory Council for privately-funded (e.g. Commodity Research Institutes) and regionally-funded (e.g. national units of CARDI) institutions.
3. NARTDEC should function as an Advisory Council to MINAG in its function of management of Agricultural Development Programmes.
4. NARTDEC should monitor the operations resulting from decisions taken in the prosecution of its three functions and should be provided with a small technical secretariat for such monitoring functions.

In Integrated Management, all publicly-funded national and regional (i.e. CARDI) institutions of agricultural research and education should be fused into single national institutions with an integrated structure. Such a National Agricultural Research Education and Development Institute (NAREDI) would include the following instruments of management (Fig. 3).:

1. Board of Directors
2. Director General

3. Administration and Finance Secretariat
4. Appointments, Assessment and Promotion Committee
5. Constituted Departments with Administrative Heads
6. Directors for the three major functions of: Research, Formal Education, Non-formal Education (Extension).

Departments should be constituted along commodity and resource lines, e.g.:

Crop Production and Post-Harvest Technology
Livestock Production and Post-Slaughter Technology
Soils and Environment
Socio-Economics and Management
Farming Systems.

Each department should be responsible for research, formal education and extension functions and staff members should be assigned duties in at least two of these functions.

With minor structural modification, but major country-specific differences with respect to institution size and deployment of sub-stations according to availability of resources, the above described structure can be implemented in all six CARICOM units. The special considerations necessary for the Eastern Caribbean States in the Eastern Caribbean Institute of Agricultural Research and Development (ECIARD) are published in a separate document (Wilson, 1985b).

Regional Networking:

The effectiveness of the national systems for research and education will be considerably increased by regional cooperation, already mandated in several official documents. It is proposed that such cooperation can be accomplished by establishment of a Regional Council, i.e. a Caribbean Agricultural Research Training and Development Council (CARTDEC) (Fig. 4). The major responsibilities of CARTDEC will include:

1. Assignment of regional mandates for areas of specialized research, e.g. breeding and training, e.g. advanced technologies to national and regional, i.e. UWI, institutions.
2. Networking of regional and national projects to effect regional availability of research results and training opportunities.
3. Facilitation of discussion of problems of research and training among agricultural scientists and managers in the Region through convening of biennial meetings.
4. Monitoring the implementation of CARTDEC discussions through provision of a small technical secretariat.
5. Integration of national RESSs with a UWI Faculty of Agriculture research and training system, through accreditation and research coordination.

PROBLEMS IN IMPLEMENTATION OF THE ALTERNATIVE FRAMEWORK

The major problem in implementation of the alternative network is perceived as conceptual. At national level, it involves the conviction of MINAGs and Governments of the efficacy of integrating the Research and Education Support System for accelerated agricultural development. Such conviction must include acceptance by Governments that the system will be removed from the day to day control of the Civil Service, in which existing mores and procedures are inappropriate for management of institutions of research and education. However, whilst such

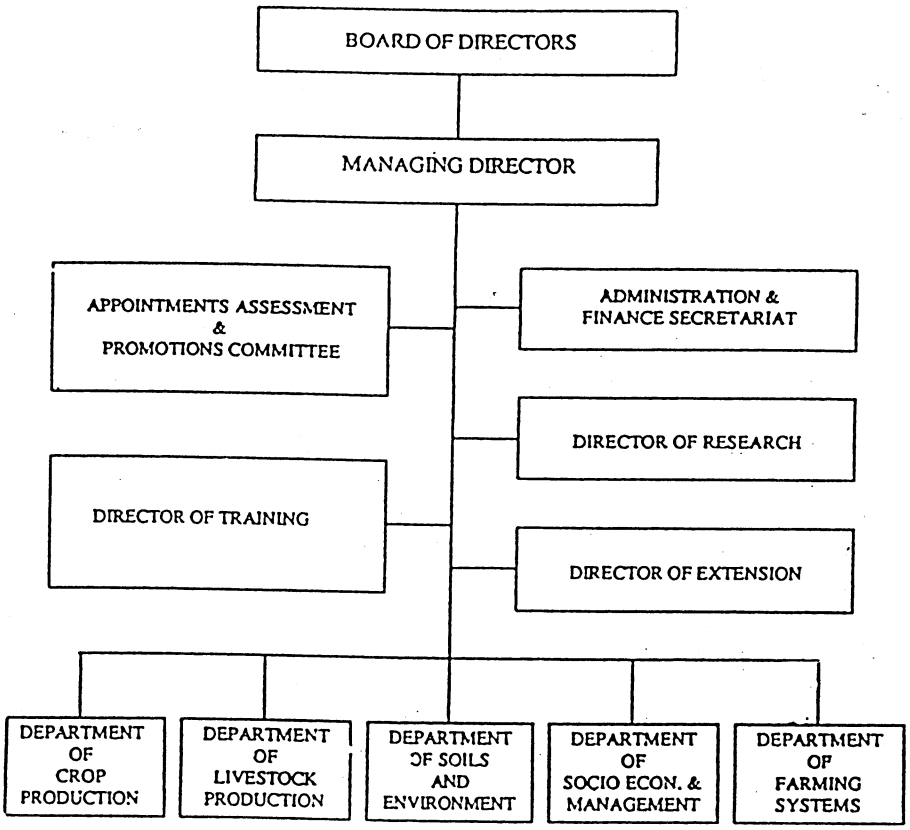
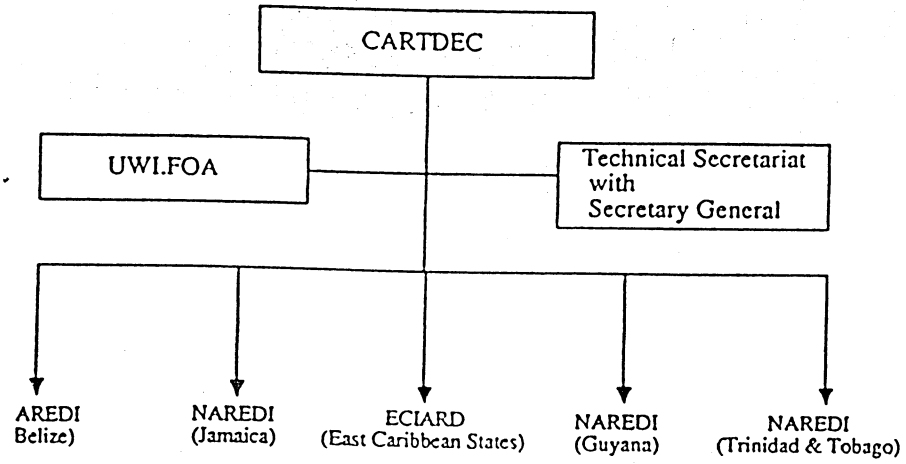


Fig. 3: Integrated Management Structure of NAREDI



Functions of CARTDEC:

Mandating of Regional Projects

Networking of Mandated Projects

Convening of Regional Meetings

Responsibility for evaluation of Regional Projects

Fig. 4: An Alternative Framework for RESS

of institutions of research and education. However, whilst such removal will result in loss of day to day control, it would also realize increases both in the efficiency of the institutional performances as well as in the control of project performance by MINAG, if the mechanism of project funding/evaluation is adopted.

At regional level, the problem of restructuring the regional research institution - CARDI is not as great as it seems. CARDI now faces a financial crisis mainly because of the reluctance or inability of Governments to contribute to the high cost of the Trinidad headquarters. Creation of NAREDIs will immediately solve this problem, if CARDI national units are absorbed by the NAREDIs and ECIARD, and Trinidad-located headquarters staff appropriately deployed. The resulting five NAREDIs plus ECIARD will realize the repeatedly expressed desire of Caricom governments to decentralize the research service , e.g. (Campbell et al., 1974). Existing formulae for contributions to research (in CARDI) and tertiary education (in UWI) should be maintained and channelled through ECIARD. Moreover, the regional character of the Caricom Research and Education Support System will be maintained and enhanced by expanding the system of mandates and research networks established some 50 years ago for cocoa and sugar, and, still in existence in the Cocoa Research Unit and the West Indies Central Cane Breeding Station. The major characteristics of this system are enshrined in the functions of CARDEC.

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