



**INTER-AMERICAN INSTITUTE FOR
COOPERATION ON AGRICULTURE (IICA)**

**CURRICULUM DEVELOPMENT AND STRENGTHENING
OF THE FACULTY OF AGRICULTURE AND FORESTRY
(UG) AND OF THE GUYANA SCHOOL OF
AGRICULTURE**

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Georgetown, Guyana
January 2012

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CHAPTER I OBJECTIVES, WORK PLAN AND METHODOLOGY

1 INTRODUCTION

The University of Guyana was established by an Act of Parliament in April 1963. Its aim was `to provide a place of education, learning and research of a standard required and expected of a University of the highest standard, and to secure the advancement of knowledge and the diffusion and extension of arts, sciences and learning throughout Guyana. The University opened for classes in October 1963.

The University's main campus is sited at Turkeyen, approximately 8km east of the centre of Georgetown. In order to extend services beyond the main campus, the Department of Extra Mural Studies was established in 1976 and upgraded in 1996 to the Institute of Distance and Continuing Education (IDCE). In 2000, a second campus was created at Tain, Berbice to fulfil similar expansion of access. The University has now been in operation for forty six (46) years and up to 2008 had produced 26,771 graduates, 25,770 from Turkeyen and 1,001 from Tain.

The Faculty of Agriculture was established in 1977 offering a Bachelor of Science (B.Sc.) in Agriculture. A Diploma in Forestry was introduced in 1987 and the B.Sc. in Forestry in 1996. The Forestry Unit was initially under the Office of the Vice-Chancellor and was placed under the Faculty of Agriculture in November 1989. At present, the Department of Agriculture offers four degree options and the Forestry Department offers two options.

The Guyana School for Agriculture (GSA) was established to satisfy a need for a national agricultural training institution in Guyana. It began operations in September 1963. In 1964, the GSA became a corporation and a Board was appointed by the Minister for Agriculture to formulate policies which would direct operations. The objectives of the GSA were as follows:

1. To offer theoretical and practical training in agriculture.
2. To develop, manage and operate farms and undertaking of an agricultural nature.

From these objectives, evolved the following statement of mission:

“to promote and support agricultural development through education and training of young men and women interested in an agricultural career”

In 2004, the GSA began a Diploma programme in Animal Health and Veterinary Public Health. In 2007 a Certificate in Fisheries was introduced and in 2008, began to offer the Diploma in Agriculture and in Forestry at the Essequibo Campus.

From the beginning, the Guyana School of Agriculture (GSA) developed a plan to form professionals to solve problems faced by the Guyanese society, in particular, those of the agricultural and forestry sectors. To fulfil its mission, the Faculty has developed and modified the curricula of both Schools, in search of pertinence and relevance of the competences of the professionals formed.

Agricultural Scenarios

The world's agricultural sector has been affected by contradictory policies, mainly because governments have tried to accomplish political, social and economic objectives, through initiatives such as regulating food prices, consumer protection, currency regulations and inflation control.

In LAC, urban-biased macro-policies adopted, have negatively affected the development and sustainability of the agricultural sectors and resulted in:

- ✓ degradation of the natural resource base and the environment,
- ✓ out-dated occupational and professional competences,
- ✓ shortage of investment resources,
- ✓ decreased investment in agricultural research, extension, education and training
- ✓ rise of interest rates,
- ✓ decreased opportunities to add value to products,
- ✓ distortion of markets,
- ✓ increased bureaucracy,
- ✓ decreased infrastructure and services, and technological stagnation.

Upon gaining membership in the World Trade Organization (WTO), LAC countries removed trade barriers and actively participate in global markets, regional and bilateral agreements such as NAFTA, CAFTA-DR, CARIFORUM, MERCOSUR, and ALBA. Today, LAC economies are more open and more conscious the need of a joint effort to solve common problems. The challenge arising from this action, for LAC countries, especially those which are large producers and exporters of food products is the diversification of production and adding value to their products. This requires policies to incentivize investments and technology development, together with strategic marketing strategies. IICA adds, that an alliance between the public

and private sectors, similar to that used by Asian countries to develop their auto and electronics industries.

In spite of the above, agriculture has played multiple important roles such as, poverty alleviation, food security and conservation of the environment and natural resource base. Agriculture has been the driving force for environmental, economic and social development in many countries, providing up to 70% of job opportunities and in some cases generating as much as 65% to the national gross product.

In LAC, competitiveness has been relevant in economic activities, evolving at a pace and speed demanded by the political setting. Today, when the globalization process has taken root, taking into consideration that global competitiveness, is not only necessary to operate in local markets, but it is also required to be synchronized with the international economy/markets. Therefore, the promotion of competitiveness amongst countries and private enterprises is mandatory and needed. Other relevant issues are sustainability and conservation of the environment and natural resource base, which are topics on the discussion tables at international forums.

Sustainable development has implications for the formation of agricultural professionals, it is accepted that these refer not only, to the need to modify the contents of the courses there is a need to modify the cultural pattern (attitudes and values). To accomplish these modifications, it is necessary to adopt new more relevant approaches in curriculum development (focused on research and innovation), innovative instructional methods, efficient academic organization and management practices and participative linkages between the academic population and the public and private sectors.

Guyana has experienced little economic transformation since independence and is still an agriculture and resource-based economy. Guyana has exhibited slow economic growth averaging only 1% since 1970. Moreover, its income volatility is quite high. Guyana's weak economic performance has been closely linked to its poor export performance, showing a heavy reliance on some export products, for which it is not competitive in international markets.

Agriculture is the most important sector of Guyana's economy, accounting for approximately 32% of GDP, 30% of employment, and 40% of export earnings. Sugar and rice, with privileged access to the European Union (EU), account for 74% of agriculture's GDP as well as 65% of total agricultural exports, including shrimp and timber. About 75% of Guyana's sugar production is exported to the EU at prices more than double the world market prices.

The Guyanese agricultural and forestry sectors are characterised by limited physical and serviced infrastructure, an out-dated legislation, inequity in access to resources, a weak private sector strategy, a weak research and extension system, a limited and inadequate technological inventory and weak sectorial institutions.

Guyana has experienced little economic transformation since independence and is still an agriculture and resource-based economy. Guyana has exhibited slow economic growth averaging only 1% since 1970. Moreover, its income volatility is quite high. Guyana's weak economic performance has been closely linked to its poor export performance, showing a heavy reliance on some export products, for which it is not competitive in international markets.

Guyana, as many other developing countries, faces three major challenges:

- to modernise and increase the sustainability of agriculture and the agricultural sector,
- become competitive in internal and external markets, with quality products and just prices, and
- link growers and their products to markets.

These challenges require an entrepreneurial transformation that promotes a renewed and amplified vision of agriculture based on crop and/or animal production systems, productivity, competitiveness and on value supply chains. This reconversion should focus on improving management skills and capacities, developing agribusiness and agro industrial capacity, increasing the capacity to develop knowledge and to be innovative.

Famers need to contribute to this reconversion by:

- farmers must grow what consumers demand, and perform as producers, transformers and marketers;
- famers must change their subsistence attitude to one of entrepreneurs;
- small-scale famers must organize in associations, clusters, federations or cooperatives;
- farmers' technological competence and in natural resource management must be increased;
- farmers should be able to readily access information and communication technology;
- government must effectively address farmers' needs, developing rural infrastructure and providing on time services, such as insurance, credit, education and training, and generation and transfer of appropriate technology and information; and

- hence, the agricultural sector requires a reconversion to face these challenges and responsibilities. To achieve the above, a strategic alliance among public, private and academic, institutions is required.

To achieve and lead the reconversion, it is necessary to develop and/or strengthen the professional resource base. Hence, this process must be oriented to:

- develop and implement, information channels and networks, and
- increase the number of active researchers and extension agents, but
- above all, the number of agribusiness men and women in agriculture.

Higher education institutions, particularly those directly related to the agricultural sector, have the responsibility to cater to the needs of rural population. To address this challenge, these institutions must:

- Establish strong working relations, between the academic population (teachers, managers and students) and the agricultural employment sector.
- Identify educational and training needs of rural populations.
- Identify competences demanded from professionals by the employment sector.
- Continuously update and improve the academic programmes, to ensure the formation of professionals with pertinent and relevant competence, to lead the reconversion of the agricultural sectors.
- Update and improve their research and extension strategy (providing teacher and student opportunities) and capacity, to become a proactive (leading) participant in the national agricultural research and extension system.

The University of Guyana is a public institution, with a national and international projection, accomplishes its mission to form professionals in a democratic and open environment, with respect to human dignity, the environment and the natural resources, and as an ally of the private and public sectors, providing valuable human resources, implementing research and extension activities, to develop sustainable alternatives to improve efficiency and sustainability for development and the natural resources. It is also an important honest forum to analyse, discuss and find solutions for sectorial production problems and food security.

To assist Guyana meet the challenges it faces and to meet the objectives related to its mission and vision, the Faculty and GSA propose a deep analysis and actualization of academic programmes, starting from a refurbished mission and vision to form professionals with pertinent and relevant competence to lead the restructuring and development of Guyana's agricultural sector. In support of this initiative, the Inter-American Institute for Cooperation on Agriculture (IICA) proposes in this document, a work plan and the methods to review and develop a

more pertinent and relevant curricula for Guyana's present and future needs and improvement plans for the FAF and GSA.

The methodological approach proposes "a search of excellence and quality through curriculum development and strengthening the institutional capacity to deliver the renewed curriculum". Outstanding in this approach, is the proposed pertinence and relevance of the academic programmes to the needs of the sector; the introduction/use of effective instructional methods and approaches, which include more opportunity to practice; integral formation based on the concepts of a multidisciplinary approach, production systems and value chains; and an effective student selection process. The approach also emphasises the conversion of the learning process into an experimental practise. The School's transparency in its relation with society, the state and to itself is the fundamental driving force to deliver quality higher education, with efficiency and competitiveness.

Eventually, the approach entails the accreditation of the academic programmes, as a mean to continuously improve the curriculum. In adopting the proposed approach, the Faculty and GSA have the opportunity provided by the process of curriculum development, to design modern and pertinent academic programmes that pave the road to national and regional accreditation.

The proposal to revamp the approach to the formation of agricultural professionals is justified by the added social value and by the following potentials:

- ✓ Satisfaction of the demand for agriculturalists.
- ✓ Contribution to the implementation of sectorial development policies for production, postharvest management, product transformation and marketing.
- ✓ Strengthening of the academic capacity of the Faculty and staff.
- ✓ Improvement of the research agenda and outputs.
- ✓ Increase and consolidation of strategic alliances between the academic population and the public and private sector.
- ✓ Improved formation and turnover rate of professors, researchers and extension agent.
- ✓ It is favourable for feedback and quality for undergraduate levels and to develop competence in research, extension and generating income.
- ✓ It allows amplifying and improving the occupational frontier for graduates.
- ✓ It facilitates the development, adjustment, validation, adaptation and implementation of new knowledge and technologies.
- ✓ It helps to open space for discussion, analysis and reflexion and debate of current topics pertinent to knowledge development.
- ✓ Increases the transfer of research results and widens scientific and technological knowledge.

In Guyana and other Caribbean countries, curriculum development or adjustment is also justified by:

- ✓ The current vertiginous changes in technological, social, working, economic, and environmental scenarios that emerge with economic globalization.
- ✓ The challenges higher education institutions face to form professional resources for solving problems for the agricultural sector.
- ✓ The search for standardization at the national, regional and international levels for academic programmes, through flexibility and competence development.

It is proposed for the Faculty and GSA to identify functions, tasks, and competence demanded from graduates through consultations with the public, private, academic, student and graduate and sectors; to learn of their opinions of graduates' performance (strengths, weaknesses and areas to improve) and of the occupational and professional demand for graduates. The results of this first phase should motivate the Faculty to design and implement **Institutional Improvement Plans**, with fundamentals on the results of a study of the occupational and professional demand, diagnoses of external agricultural scenarios, of an auto-evaluation of the Faculty and the GSA and the development of curricula based on competence.

2 OBJECTIVES

2.1 General Objective

Strengthen the Faculty and GSA, by developing curricula up to national and international standards; by improving the academic management capacity for delivering the curricula and innovative agricultural professionals with the necessary competence to lead and guide the reconversion of Guyana's agriculture and the achievement of sustainable rural development.

2.2 Specific Objectives

Objective 1

Analyse and describe the present global, regional and national agricultural scenarios and that of the GSA and FAF, to establish a conceptual frames for the environment in which their graduates will perform.

Objective 2

Identify the demand, the competences (knowledge, aptitudes, skills, attitudes and values) and graduate profiles pertinent and relevant to the needs of the Agricultural Sector.

Objective 3

Improve the practical formation of students and link the academic population to the agricultural employment sector, increasing practice and internship opportunities for students and establishing an updated agricultural research and extension strategy.

Objective 4

Develop and validate a curriculum based on competence that will improve the analytical capacity of graduates and adapt the contents of the plan of studies to the needs of the agricultural sector.

Objective 5

Design a plan to improve and strengthen the capacity of the Faculty and GSA (including internship guidelines and a comprehensive strategic plan for agricultural research and extension programme) to deliver the new academic programmes and professionals with the competencies demanded by the employment sector.

2.3 Expected Products

1. Characterization of the agricultural sector and the internal scenario of the Faculty and GSA.
2. Curricula based on competence.
3. Improved research and extension strategy.
4. Internship guidelines.
5. Institutional strengthening plan.

3 WORK PLAN

3.1 Objective of the Consultancy

The objective of the assignment is to support the Ministry of Agriculture's modernization programme through assistance to the Faculty and the GSA in improving the quality and relevance of their agricultural education programmes.

Under the supervision of the IICA Representative in Guyana and the Dean of the Faculty and the Director of GSA, the consultant will facilitate, guide and coordinate the process to review or develop, a curriculum based on competencies for undergraduate studies in agronomy/agriculture. Beginning with the occupational and professional demand study and ending with the submission of the new curriculum and plan of studies.

3.2 Scope of Work

Under the supervision of the IICA Representative in Guyana and the Dean of the University of Guyana, the consultant will facilitate, guide and coordinate the process to review or develop, a curriculum based on competencies for undergraduate studies in agronomy/agriculture. Beginning with the occupational and professional demand study and ending with the submission of the new curriculum and plan of studies.

3.3 Work Plan

This collaboration will cover the period September 21 to December 16, 2011.

FIRST STAGE

Activity 1: Preparation and methodology development (**September 21 – 26**)

With the assistance of the Guyana Focal Point (GFP), obtain and review background information on:

1. Guyana's agriculture and agricultural sector (Policies, legislation and economic scenarios).
2. The University of Guyana and Faculty: (mission, vision, strategic objectives, etc.).
3. Guyana School for Agriculture: (mission, vision and strategic objectives; teaching-learning resources and faculty).
4. Present academic programmes.

The analysis of the information will guide the design of the methodological proposal and the script for the discussion groups for the qualitative demand study.

Activity 2: Curricula Development Team member identification and selection (**September 27 – October 1**).

The members of the Curricula Development Team will be identified and selected from amongst the Faculty and administrative staff.

Activity 3: Training Workshop on demand study and profile development (**October 13**)

The Curriculum Development Team (CDT) will be trained on:

1. Facilitating the discussion groups.
2. Identification of contributors.
3. Organization and analysis of the information gathered.
4. Identification and concentration of functions, tasks and competencies.
5. Occupational and professional profile development.

Activity 4: Qualitative Occupational and Professional Demand Study (October 14 – 15)

In collaboration with the GFP, the Consultant will organize and facilitate the meetings with informants from the private and public employment sector, alumni, students and Faculty. The information gathered will allow to characterize the working scenario for future graduates and to develop a knowledge base to plan for future working scenarios, the required professional profile, the expected competencies future graduates should master and present and future professional demand.

Activity 5: Training Workshop on curricula development (October 17).

The IICA Training Officer will organize, facilitate and tutor a training workshop on curriculum development. The CDTs will be trained on the following topics:

1. Identification of demanded competence.
2. Identification of descriptors for each competence.
3. Identification of the needed content to acquire each competence.
4. Timing and sequencing of courses.
5. Construction of the curricula grids

Activity 6: Organization and analysis of the opinions gathered (October 18 – November 11)

The CDT, with assistance of the Consultant, will transcribe, concentrate, analyse and interpret the opinions of the contributors, by category and subcategory from each of the discussion groups. The CDT will then, concentrate the opinions by category and subcategory across groups.

SECOND STAGE: Curriculum development (November 11 – December 16)

Activity 7: Construction of the new Occupational and Professional Profiles (November 14 – 16)

Based on the information gathered through the demand study, the CDT, with the assistance of the IICA Training officer and the Consultant, will construct the new occupational and professional profiles, which will be the raw material for developing the new curriculum.

Activity 8: Training workshop on descriptors for competencies (November 17 – 18)

The Consultant will organize and deliver a training workshop to review the process for identifying descriptors for each competence, sequencing competences into fields of action (modules).

Activity 9: Construction of the new curriculum (November 21 – December 5)

The consultant, in collaboration with the GFP, and CDT, will organize and facilitate the construction of the new curriculum, based on the information gathered through the qualitative demand study. The Consultant will guide the evaluation of the new curriculum.

Activity 10: Submission of report (**December 6 - 16**).

4 METHODOLOGY

In figure 1, an overall strategy of the five components of the work plan is depicted. In this section, the methodology used to develop each component is described. In Figure 2, the strategy for developing the curriculum is depicted.



Figure 1. Work process strategy.

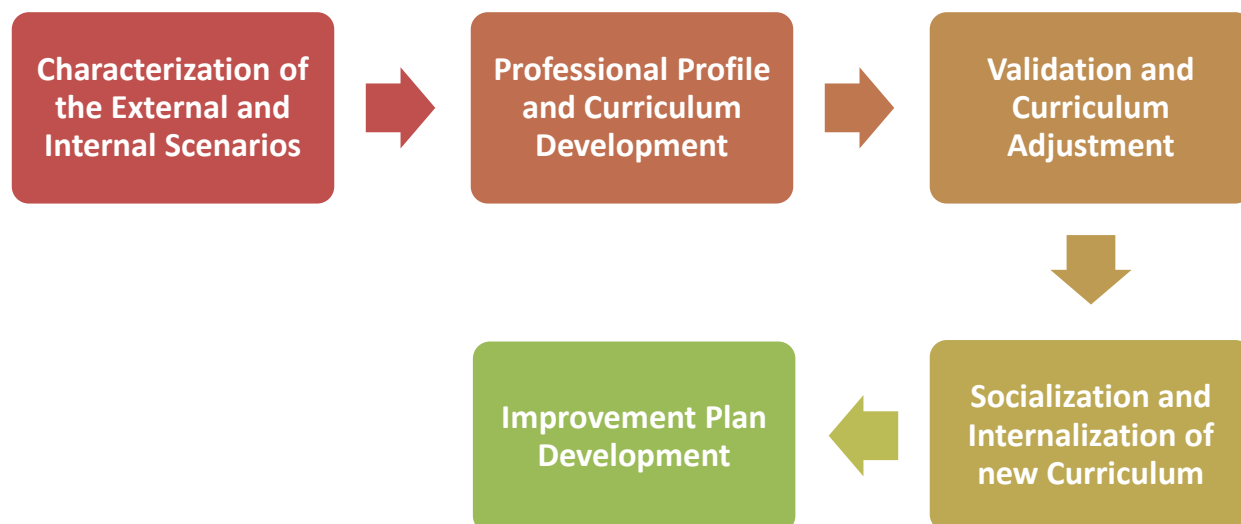


Figure 2. Curriculum development strategy

4.1 External Scenarios

To describe the trends in the Global and Regional agricultural scenario, a literature review will be conducted, particularly those related documents and publications from ECLAC, IICA and FAO. To describe the national scenarios for agriculture and higher agricultural education, relevant actors of the sector will be interviewed and literature from the Ministry of Agriculture, ECLAC, IICA and FAO will be reviewed.

4.2 Internal Scenarios

The characterization of the internal scenario (academic management, teaching-learning resources, curriculum, faculty, students and alumni), requires the review of institutional documents, in situ observations, and directed interviews of selected informants. However, some structured interviews to well-known national informants will be conducted.

4.3 Qualitative Occupational and Professional Demand Study

4.3.1 Gathering Information

To gather the necessary information a “group discussion” methodology will be used. This methodology entails the organization of the discussion groups to learn of subjects that fall outside the group’s relation, but which are of common interest for

all participants. As the study's title suggests, the study is not designed to quantify the occupational or professional demand, it is rather designed to: a) establish a frame of reference for the opinions and results, b) characterize the working scenario of future graduates, and c) gather the opinions of participants, in relation to new work scenarios, the required professional profile, the level of performance of graduates and of the demand and opportunities for future graduates.

4.3.2 Selection of Informants

Informants are selected from a "theoretical type" sample. In selecting informants, the following factors are to be considered: credibility, capacity to communicate opinions related to the agricultural sector and education, the sample does not correspond to statistical criteria, but relates to informants and their relations to agricultural topics and group interaction. Six to twelve informants, is the recommended group size. Informants are selected from those socioeconomic subsectors of interest. Several selection criteria may be used, which focus on relevant socioeconomic aspects related to the informant's productive activity, or their academic activity, willing to change, social recognition, pertinence to a link of the agricultural value chain and gender.

Informants for the production or agro-industry groups may be selected from five sectorial strata: traditional agriculture, staple foods, vegetable crops, animal husbandry, forestry and product transformation. Informants for the service group, informants may be selected from: the extension service, private consultants, marketing, suppliers, and credit subsectors. Informants for the academics group can be selected from any of the agricultural schools, within or from other universities; there must be a representation of the most relevant occupational fields. Informants from the graduates can be selected a diverse occupational fields (teaching, research, extension, sales, extension, etc.), the informants must be active in their field. Informants for the student group should be selected from the population of second year of studies and higher, gender representation is required. Informant for the public sector group should be active in public institutions such as related ministries, research, extension, development, policy, etc.

The recommended number of informants per group is between 10 and twelve, with a minimum of six. This number of participants facilitates the discussion process, ensuring equity in participation, that is that individual informants are not isolated, or for one informant to impose his/her opinion on the group. With the recommended group size, a better use of time and the participation of all informants is possible. This facilitates the recording of the opinions by the facilitator team.

Once identified and selected, the informants are invited to participate, being informed of the objective and expected outputs of the group session. Efforts have to be made to ensure the recommended group size, with the desired composition and representativeness in relation to type, size and level of development of the informants' enterprise.

4.3.3 Process

For the group sessions, an appropriate environment is desired. The meeting room is conditioned to facilitate and record the discussion, so the expected information can be easily gathered. The meeting room is "closed to the outside" but "open in the inside", that is without outside distractions.

To achieve the objectives of the group sessions, the Consultant or IICA Official will act as facilitator/moderator. The moderator will be assisted by the local Team, taking notes of the discussions, recording individual and interpreting the interventions.

Before each session, the Moderator prepares to act as "circumstantial leader" of the group sessions. Consequently, the moderator is prepared to make decisions and guide the groups in an orderly discussion. The moderator may also initiate or provoke a dialogue on a specific subject at a particular time, to motivate informant participation and/or weave relations between topics. These opportune interventions also prevent deviations by informants, avoid conflicts amongst informants and allow a better use of time, maintaining a convenient rhythm of discussion.

The purpose of the group discussions is to achieve collective representation, not of an individual. Each group discusses and debates to reach concerted conclusions, stemming from diversion or consensus of opinions. This approach facilitates and motivates the auto discovery, analyses, and description of ideas, attitudes, experiences and personal behaviour by participants. Moreover, in the discussion groups, a social context is produced, in which information, observation and participants' statements become more realistic in sense, than could be achieved through an individual interaction between moderator and informant. Another of the advantages of the group discussion method is the opportunity to obtain information from a larger number of informants, reducing time and effort. The four phases of the sessions are depicted in Figure 3, and these are detailed ahead.

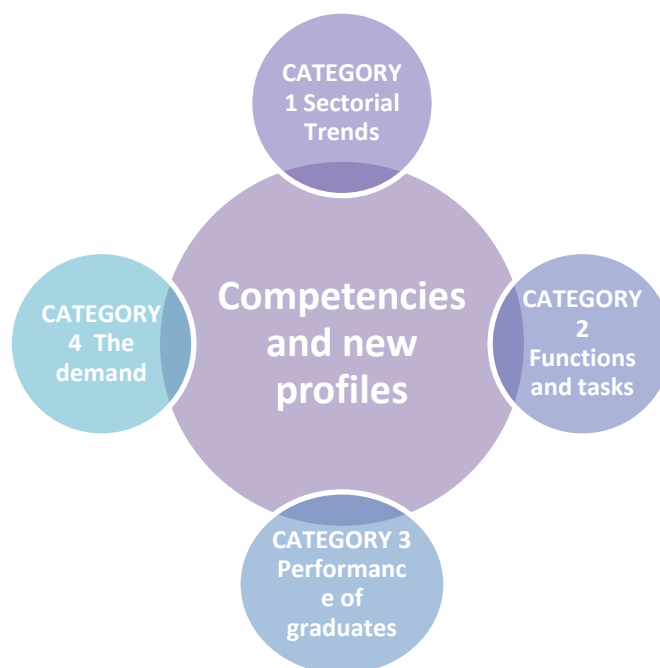


Figure 3, Phases of the Discussion Groups

Phase 1

The moderator begins the session welcoming and thanking the participants and introducing the Team and the informants, to create an environment based on trust and expectations. The moderator invites the informants to a spontaneous and free dialogue, so as not to feel constricted by their personal lives outside the group. The moderator finalizes the first phase detailing and explaining the topics to be discussed and the mechanism for the discussion; each topic will be treated separately and everyone will have equal opportunity to express his/her opinion.

Each group session will begin with a general question, to learn the opinion of participants of the trends in the development of the agricultural sector. The informants are prompted to discuss relevant policy, legislative, economic, and of other technical changes that affect the Guyanese agricultural sector. The moderator then guides the informants to discuss projects and structural adjustment programmes, decentralization processes, marketing, financial trends and technological innovation.

Phase 2

In the second phase, topics related to functions and tasks performed by agricultural professionals are discussed. In this phase, the group is guided to identify the competence (knowledge, abilities, skills, attitudes and values) demanded from

Phase 3

In the third phase, the group is invited to discuss the performance of graduates in their role as promoter of the development of the agricultural sector. If performance is not up to expected standards, the main causes are to be identified. It is stressed to identify strengths, weaknesses of the curricula and formation aspects that need to be strengthened.

Phase 4

In the final phase, the group identifies present and future occupational demand for professionals with the proposed competence in phase 2. The group also discusses opportunities for graduates with entrepreneur spirit.

4.3.4 Script for the Discussion Groups

In table 1, the script to facilitate and guide the group discussions is detailed. It also guides the data management, analyses and synthesis of the information gathered.

Table 1. Script and codes for discussion groups

What needs to be known?	What information to request
Category 1 <i>Trends and course of agricultural, forestry, and rural development in Guyana</i>	1.1. Policy and legislative issues that affect now or will in the future: (New legislation, development plans for agricultural and rural development, structural adjustment programmes, decentralization processes, etc.) 1.2. Economical changes: (Economic, market and financial trends) 1.3. New technological paradigms (sustainable technologies for competitiveness, and sustainable development) 1.4. Others
Category 2 <i>Professional functions and tasks at medium and long term</i>	2.1. Functions (Management, administration, technical assistance, research, extension, etc.) 2.2. Competences (knowledge, aptitudes, skills, attitudes and values)
Category 3 <i>Performance of graduates as agents of change in agriculture. In case his/her performance is not up to standard, what are the main factors/causes?</i>	3.1 Strengths What are the outstanding competences of the graduates? 3.2 Weaknesses What are the weak components of the competencies of the graduates? 3.3 Areas to strengthen What fields of learning/competences need to be strengthened
Category 4 <i>Present and future demand for professionals</i>	4.1. Is there a demand for recent graduates? 4.2. Will there be a demand in the future? 4.3. Do entrepreneur graduates have opportunities?

4.3.5 Data management

All individual interventions in the group sessions are recorded and transcribed in the order they occur for processing and interpretation. The next step is to concentrate within each group, all the transcriptions by theme, this allows a first summary by group of discussion. These summaries allow a first synthesis by group and by topic categories and sub-categories, after which a first "cleaning of information" can be accomplished; eliminating all interventions which fall out of context (colloquial, digressions, etc.)

Once the information is organized by category and sub-category, the information can be analyzed and interpreted, consisting of a summarized description followed by illustrative citations. Great detail is required in this information management process. The most illustrative information of a topic discussed is selected. Each intervention is synthesized, without altering its true meaning.

The four categories discussed are useful to structure the analyses and interpretation of the information gathered. The categories are divided into sub-categories to achieve the needed depth of analysis. To achieve an appropriate sequencing of the information, a first reading of the individual contributions in each topic and subcategory is needed. Afterwards, a summary of the interventions by sub-category is prepared and substantiated by expressions in support of the general statement or synthesis.

Now a comparative analysis of the general statement of individual groups can be performed, with the purpose of reaching consensus of conclusions for each discussion topic. Similarities, differences, consensus, contradictions in the different group arguments are identified for each sub-category. At the end, a general summary of all sub-categories within each category is prepared.

4.4 Curriculum Development

Traditionally, universities have developed the curricula based on disciplines and have focused the acquisition of cognitive capacities by the students. The methodology for curriculum development here proposed, is based on competence, and was adapted from those used by IICA, the University of Cordoba, Colombia and the University of Talca, Chile. This methodology, participative in nature, is implemented through a workshop and was conceived as an instrument to analyse occupations and processes, generating those elements required to conduct a functional analysis and put into practice, a close relationship between the academic population and the agricultural employment sector.

With the focus on competences students must have at graduation, the clustering of fields of action is given by the capacities required by each competence. Thereby, the proposed methodology begins with linking fields of action to a competence. In the following phases, the capacities to develop to achieve a given competence, products, learning and evaluation activities, required times and the appropriate sequence between learning modules must be established.

4.4.1 Conceptual framework

An education based on competence, is derived from a curriculum based on a prospective analysis of the society and on the intent to certify student progress based on yield or the demonstration of mastering one or more competences required.

This approach focused on competence emerges in Canada at the beginning of the 20th century in blue collar training and the practice to link students to real working

scenarios. But it was with the deep structural adjustments and economic changes that occurred in the 1970s, that the approach gained recognition and relevance. These changes posed the challenges to increase efficiency, productivity and economic feasibility in education and training. In this context, the competence of human resources becomes a key factor, not only for the consolidation a projection of enterprises, but also for their sustainability. Since then, the challenge became the linkage between universities and the private sector, to reduce the existing gap arising from the given focus on the achievement of cognitive capacities, over their application within the context of a working scenario.

The main difference between the proposed approach and the traditional method, is that the competence is not achieved only by approving a curriculum based on cognitive objectives in real working scenarios, but rather by the application of knowledge in these scenarios, making it possible to transform learning experiences into mastering a competence. Therefore, an education based on competence focuses on the results of the learning process.

There several reasons to justify the use of this approach in the formation of professionals, among these it is worth noting:

- ✓ easiness of evaluating the learning process at graduation,
- ✓ it allows good communication with employers and guarantees the competence of graduates, and
- ✓ facilitates quicker insertion into the working scenario and adjustment of graduates to the requirements of required professional performance and yields greater earlier productivity of graduates.

It is recognised that the implementation of a curriculum based on competence poses at least three challenges:

1. **To curriculum design and teaching:** a new role to be assumed by teachers, focusing on learning rather than on teaching; more linkage between theory and practise, requiring more interaction with the employment sector.
2. **To institutional management:** a continuous improvement process, a life-long formation process, and certification of competence.
3. **To the global system:** moving from the classroom to practice and progressive advances in learning modules.

The "vision" of most universities include the concept of integral formation. In this sense, it is proposed for universities to base the purpose of integral professional

formation in academic programmes, including in the curriculum structure, the following competences:

- ✓ Competence to know how to learn, it refers to the learning processes used by students to appropriate, develop, elaborate and understand knowledge, and to take action accordingly.
- ✓ Competence to know how to do, it refers to the skills, abilities and capacities through which professionals apply acquired knowledge and behaves according to the demands in the job context.
- ✓ Competence to know how to be, it comprises and adequate integration of values, know how, habits and abilities that contribute to a harmonic development as a person and as a social being.
- ✓ Competence to know how to interact, it constitutes the preparation for life and the exercise citizenship that leads to the development of critical and reflexive thinking, intellectual autonomy, ethical and social formation and tolerance.

The proposed review and adjustment of the curricula, is based on flexibility, to facilitate the development of autonomy of students, in their academic election and in their methods and work rhythms.

4.4.2 Process

The proposed process for curricula development is as follows and is depicted in Figure 4.

- ✓ Establishment of Curriculum Development Teams and assignment of responsibilities.
- ✓ Training of the Teams.
- ✓ Qualitative occupational and professional demand study.
- ✓ Processing and analysis of the results of the demand study.
- ✓ Identification of competences and construction of the professional profiles.
- ✓ Identification of descriptors and contents for each competence of the academic programme.
- ✓ Construction of the curricula.

Phase 1. Identify the fields of action.

The starting point is the identification of professional for competencies (knowledge, aptitudes, skills, attitudes and values) demanded in the labour sector to be satisfied, to which a specific field of study (action) is associated. That is, each competence is associated to a corresponding field of study (module). In this phase, the labour sector has a leading role in identifying fields of study (action),

competencies and the resulting professional profile; while academicians are responsible to identify the contents for each competence and field of study. The resulting information – competences or expected products at the conclusion of the field of study and required knowledge, aptitudes, skills, attitudes and values to achieve the competency, is of special interest to the academic managers, decision makers, professors, students and evaluators.

Phase 2. Sequencing the fields of study

Having identified the fields of study (action), these must be placed in an appropriate sequential time-order, based on criteria of precedence or related order and following a predetermined learning model (from theory to practise, from practical to conceptual, from simple to complex, from concrete to abstract or vice versa, etc.). It is assumed, that all fields of study (action) may or not have, one or more fields of study as a pre-requisite or co-requisites that need to be implemented simultaneously. The result is a first graphic draft of the academic programme.

Phase 3. Structure the identified fields of study.

Having a first approximation of the academic programme, the next step is to structure each field of study (action). This implies that information produced in this phase, must include the contents to be delivered and an estimate of times and resources (literature, infrastructure, equipment, etc.) required.

Phase 4. Review fields of action and/or competences.

Once the competence, required resources and times committed in each module and the total amount of time demanded from the student by each learning activity (including classroom, laboratories, field work, individual learning or reading, case studies, etc.) are known, these should be screened through the School's rules and regulations.

If a field of study results too large, it prompts the need to review modules or competences; by redefining competences into more than one; or dividing the field of study into two. If it results too small, a competence may be paired up with a similar one.

Therefore, the correspondence between competence and field of study, may be altered as a result of the analysis of times, allowing the existence of modules that may develop more than one competence or the development of a competence through more than one field of study.

Phase 5. Review of the curriculum.

The draft academic programme considers competence, pre-requisites and/or co-requisites required to advance to a new field of study. However, it does not consider the balance of times for each academic period. It proceeds to review and adjust the draft academic programme (sequence, times, requisites and challenge competences), which means returning to Phase 1.

Phase 6. Curriculum development.

With the competence and contents to achieve or deliver, defined for each field of study, conditions are set to develop the curriculum. Hence, plans of study should be developed for each field of study (module).

The curriculum is the official document that describes the organization of courses, contents, required resources, and time demanded by each learning and evaluation (of students and teachers) activities and the expected accomplishment levels; establishing sequence, coherence and progression among the competencies linked to the learning units. For existing degrees, the methodology proposes not to consider the current curriculum.

Even though the phases have and are presented in a sequential order, it is possible to go back, at any point of the process, to review and make pertinent and/or substantial adjustments. This is useful for practical purposes, to adjust" the curriculum to existing restrictions, related to institutional limitations, limited teaching resources, time and sequential limitations. It may even happen, to be necessary to reconsider competences in the related professional profile. Once the final curriculum is drafted, all future changes to the professional profiles as a consequence of changes in the employment sector, need to be reflected in the academic programme. Considering the correlation between fields of study and competences, the proposed methodology facilitates their modification. The following situations may occur:

- ✓ a new competence may be added to the professional profile, a corresponding field of study needs to be added to the curriculum or insert it into an existing one;
- ✓ on the other hand, a competence may be removed from the professional profile, the corresponding fields of studies must be modified; or
- ✓ a competence may be modified in a professional profile (new knowledge, abilities, skills, values) are added or removed, the related fields of study must be modified accordingly.

The proposed methodology facilitates this modification process, as it allows the “isolation” of affected competences. Consequently, the methodology not only guides curriculum development, but also facilitates keeping it up-dated and competence oriented. This is particularly useful in rapidly changing working environments.

The most difficult stage of the methodology is the identification, inter-relating and sequencing of appropriate these fields, particularly, when the capacities required in a competence are not well defined.

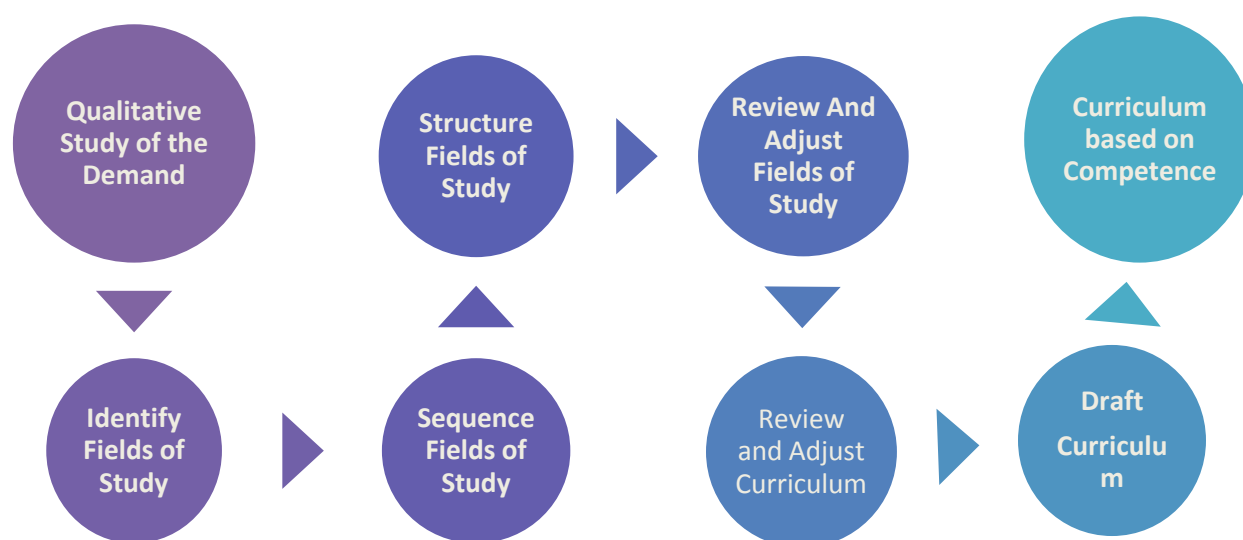


Figure 4. Steps in Curriculum Development

4.5 Internship guidelines

The internship guidelines will be developed using information gathered through the occupational and professional demand study, past experiences and the existing relations between the university and the employment sectors.

The process will be as follows:

1. Analysis of previous experiences and internship programmes.
2. Analysis of the results of the qualitative demand study.
3. Establish a conceptual frame, objectives and scope of the guidelines.
4. Develop a strategy to link the academic population to the agricultural labour sector.
5. Draft the guidelines.

4.6 Integrated Scientific – Technological System

The research and extension strategy to be developed will have its fundamental base, the participation in the national and regional research and extension systems; and to respond to farmers' knowledge and technological needs. The main components of the strategy may be:

1. Analysis of the national research and extension strategy.
2. Analysis of the and Faculty's and GSA's research and extension strategies.
3. Design a mechanism to establish the agenda and funding of the Faculty's and GSA's research and extension activities.
4. Draft a document that describes the research and extension strategies.

4.7 Improvement Plans

Institutional Teams will be established to develop the corresponding institutional improvement plans. The teams may be guided by the following:

1. To develop the improvement plan, it is desirable for the Deans and faculty members of the Faculty and GSA to support the Team.
2. The Teams should implement the following activities:
3. Develop a format for project profiles and the plan;
4. Analyse and validate the results of the qualitative study of the demand and those of the internal and external scenarios;
5. Select those factors to improve. To design project profiles, the team may want to divide into two or three sub-teams.
6. Each sub-team will select those factors to improve and for which they will design project profiles.

To design project profiles for the plans, the teams may be sub-divided into two or more ad-hoc teams. Each ad-hoc team would accept responsibility to identify and select factors to improve and drafting the corresponding profiles.

CHAPTER II

GLOBAL, REGIONAL AND NATIONAL AGRICULTURE SCENARIOS

1 INTRODUCTION

The characterization of the global, regional and national agricultural scenarios has the purpose to develop a framework in which the graduates of the Guyana School of Agriculture and from the Faculty of Agriculture and Forestry perform. It also provides information related to expected competences from the graduates.

2 GLOBAL AND REGIONAL AGRICULTURE SCENARIOS

2.1 Policies

Arias (1), concluded that the world's agricultural sector has continuously been affected by contradictory policies, mainly because governments have tried to accomplish political, social and economic objectives, through initiatives such as regulating food prices, consumer protection, currency regulations and inflation control. Likewise, in the latter 1980's, world policies focused on opening markets and economies (globalization) – markets establish the rules. As a result, world agriculture has been weakened and to worsen the situation, investments in agriculture have decreased as a result of structural and sectorial economic adjustments made.

In Latin America and the Caribbean (LAC), urban-biased macro-policies adopted since the 1960's, have negatively affected the development and sustainability of national agricultural sectors in many ways, amongst the most outstanding are: degradation of the natural resource base and the environment, out-dated human resources, stagnation of managerial capacities, shortage of investment resources, rise of interest rates, increased crop harvest losses, decreased opportunities to add value to products, distortion of markets, increased bureaucracy, increased limitations in infrastructure and services, technological stagnation and decreased investment in agricultural research, extension, education and training (1).

Upon gaining membership in the World Trade Organization (WTO), LAC countries removed trade barriers and actively participate in global markets, regional and bilateral agreements such as NAFTA, CAFTA-DR, CARIFORUM, MERCOSUR, and ALBA. Today, LAC economies are more open and more conscious the need of a joint effort to solve common problems (10). The challenge arising from this action, for LAC countries, especially those which are large producers and exporters of food products is the diversification of production and adding value to their products. This

requires policies to incentivize investments and technology development, together with strategic marketing strategies. IICA (16) adds, that an alliance between the public and private sectors, similar to that used by Asian countries to develop their auto and electronics industries.

Despite the above, agriculture plays multiple important roles such as, poverty alleviation, food security and conservation of the environment and natural resource base. Agriculture has been the driving force for environmental, economic and social development in many countries, providing up to 70% of job opportunities and in some cases generating as much as 65% to the national gross product (8).

The Jagdeo Initiative identified and defined key, crucial and binding constraints to agricultural repositioning in the Caribbean Region and aimed to develop and implement targeted, focused and practical interventions at both the regional and national levels to overcome the constraints. This exercise, proposed by President Bharrat Jagdeo of Guyana, has been endorsed throughout the Caribbean. Limited financing and inadequate new investments, outdated and inefficient agricultural health and food safety systems, inadequate research and development and fragmented and unorganized private sector are some of the constraints identified. Insufficient land and water distribution and management systems, deficient and uncoordinated risk management measures and inadequate transport systems are other elements outlined in the initiative (B3).

2.2 Recent Events

2.2.1 Food Prices

The rise in food prices is not a new event, it is a periodical happening, and however, the most recent rise is recognised for its intensity and high rate. According to FAO (12), the main causes of this rise are: 1) the supply, 2) the demand, 3) remedial actions by individual countries, and rising currency exchange rates. Among other causes, FAO identifies the use of food crops to manufacture biofuels, increased oil prices and the reduction in the reserves of commodities. In summary, the overall effect of this rise in food prices is a reduction in financial resources for food production and procurement, which leads to higher food insecurity in developing countries.

The gradual reduction in the level of commodity reserves, since the 1990's, is another factor related to the offer, which has influenced considerably agricultural markets. The levels of world reserves have decreased in 3.4% since 1995, mainly because the demand has been higher than the offer (8). Diverse changes in international norms, rising after the Uruguay Round, have contributed to further

reducing the reserves of the world's leading food exporting countries by decreasing reserves held by public institutions, increased storage costs, risk management strategies, greater buying power of emerging economic powers and improved information and transport systems.

2.2.2 Food Crisis

Most of the countries affected by the food crises are those of low income and food deficit, which are net importers of food and oil products. FAO (10) identifies among the consequences of this crisis, socio-political instability, increases in food-import bill, increased vulnerability to food insecurity, increased undernourishment, increased cost in food aid and decreased access to production resources (inputs and services).

As FAO (11) points out, given the level of food scarcity, the levels of food reserves, will recover slowly, especially, if disasters (natural or caused by humans) continue to affect agriculture. The increased demand of agro-fuels, will continue to be an important food-scarcity related factor, if world oil prices keep increasing, if subsidies for agro-fuel production are sustained and/or if the development and marketing speed of second generation agro-fuels is not hastened.

IICA (19), reports that during the last two decades important changes have occurred in world and regional agriculture. The impact of innovative technology, globalization, new levels in food demand from developing countries and the impact of climate change have given rise to new concerns, challenges, but also opportunities. Even under this context of uncertainties however, that agricultural production is undergoing substantial changes relevant to rural life.

According to IICA (18), the increase in food prices and the loss of agricultural resources (genes, soils and water) demand a re-evaluation of agriculture. There are opportunities for countries that have a large natural resource base and are exporters of food products. There are also opportunities for those countries that can increase their agricultural production, through policies that increase the possibility to substitute food imports and even become food exporters. Competiveness is the central axis in these strategies, and within it, technology innovation is the driving force. It must be kept in mind, the importance of public policies and the role governments play in generating and transferring agricultural technology. Also important to keep in mind, is that the increasing role the private sector plays in transferring technology at international level, calls for strategic alliances between the public and private sector, both at the national and international levels.

Poor farmers have faced this crisis by: borrowing money, migrating in and out of their country, selling actives (such as cattle), engaging in other economic activities, adjusting their expense and food consumption patterns, adjusting their food expense pattern (buying least expensive foods such as those rich in carbohydrates), reducing health expenditures and increasing work for women and children (10).

To increase farmer's resilience, measures have to be taken, such as those recommended by FAO and IICA. IICA (18) suggests that in response to the magnitude of the protracted crisis, each affected country must implement strategies appropriate to their individual conditions. In the development of these strategies, the following must be considered:

- The resulting policies must maintain equilibrium in short and long-term impacts. - Over-aggressive strategies or strategies oriented to regulate consumer prices may be disincentives for production in the medium or long term, and consequently, exacerbate the problem.
- The design and selection of policies must be coherent with existing institutional capacity.

FAO (12) recommends, first to solve the food crisis, strengthening social networks, adapt policies to promote sustainable rural development and increase productivity, local food production, especially through small scale farmers and improve marketing capacities.

The impact of food crisis on the world's population is summarized in Table 1. According to FAO (SOFI 2010), 847.5 million (13 per cent of the world's total population) was undernourished in 2010, most (835.2 million) of these people lived in developing countries; Asia and the Pacific and Africa, are the regions with the largest number of undernourished persons. Latin America and the Caribbean has only eight per cent of its total population undernourished. Undernourishment in Guyana (7% of the population), is below the average of LAC (15).

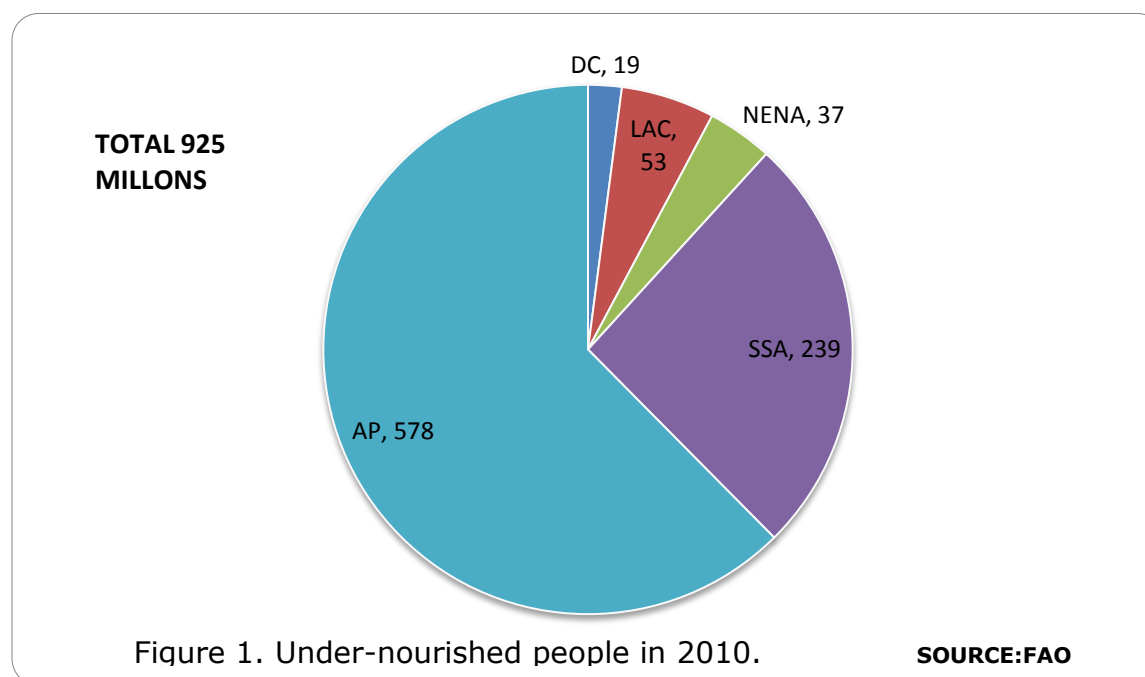
Table 1. Under-nourishment Prevalence in the World.

WORLD/REGION	TOTAL POP 2005-07 MILLIONS	MILLIONS OF PEOPLE UNDER NOURISHED 2005-07	% OF PEOPLE UNDER NOURISHED 2005-07	PROGRESS IN PREVALENCE TOWARDS MDG
World	6,559.3	847.5	13	0.8
Developed Countries	1,275.6	12.3	NA	0.8
Less Developed Countries	5,283.7	835.2	16	0.8
Asia and the Pacific	3,558.7	554.5	16	0.8
Africa	888.4	207.2	28	0.8

LAC	556.1	47.1	8	0.7
Guyana	0.8	0.1	7	0.4

SOURCE: FAO

FAO (15) indicates that the number and the proportion of undernourished people have declined, but they remain unacceptably high (Figure 1). After increasing from 2006 to 2009 due to high food prices and the global economic crisis, both the number and proportion of hungry people have declined in 2010 as the global economy recovers and food prices remain below their peak levels. But hunger remains higher than before the crises.



During most of 2011, the FAO Food Price Index remained nearly unchanged in August but was 26 per cent higher than in August 2010 (Figure 2). International cereal prices rose in August, in particular wheat. In Eastern Africa, cereal prices remained at near record levels despite some declines. In Western and Southern Africa, prices of domestically produced cereals continued at generally low levels, despite seasonal fluctuations. In Far East Asia, domestic prices of rice increased in several countries but were stable in others. In CIS countries, wheat flour prices fell moderately but remained significantly higher than a year earlier. In Central America, maize prices eased somewhat but were still very high, while those of beans declined. In South America, cereal prices were generally stable but at high levels (16).

The FAO Food Price Index (FFPI) averaged 231 points in August 2011 (Figure 2), nearly unchanged from July and 26 per cent higher than in August 2010. The FAO Cereal Price Index averaged 253 points in August, up 2.2 per cent, or 5 points,

from July and 36 per cent higher than in August 2010. The FAO Oils/Fats Price Index averaged 244 points in August, following a declining trend since March but still remaining high in historical terms. The FAO Dairy Price Index averaged 221 points in August, significantly down from 228 points in July and 232 points in June but still 14 per cent higher than the same period last year. The FAO Meat Price Index averaged 181 points in August, up 1 per cent from July. The FAO Sugar Price Index averaged 394 points in August, down 2 per cent from July, but still 50 per cent higher than in August 2010(16).

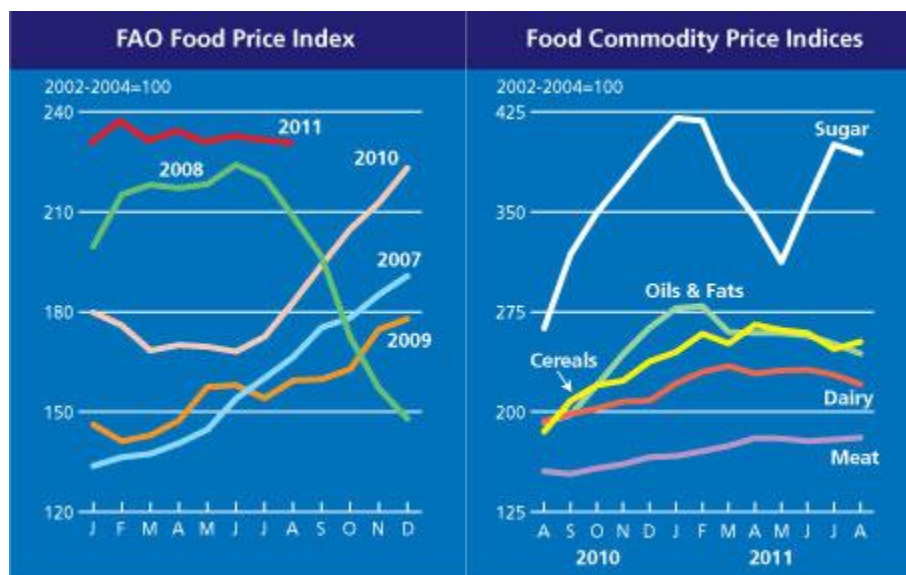


Figure 2. FAO Food Price and Commodity Price Indices for September 2011

2.2.3 Financial crisis

FAO (12) estimates that the economic crisis, which began in 2008, has reduced capital, reduced export opportunities and restricted credit, has led to a slower growth rate in many countries. The decrease in remittances of monies by emigrant workers, a primary source of income for countries in Central America, the Caribbean and Mexico, has negatively impacted the economic growth rate of these countries and reduced internal consumption rates.

By far, the most impacting effect of the economic crisis, is that in 2009, the number of hungry people increased in 100, million, an eleven per cent increase in the number of undernourished persons. This increase in food insecurity is not a result of crop losses or food deficits, but as a result of the economic crisis, which reduced access to food by the poorest of poor, at a time, of high food prices (12).

ECLAC (3) informed that in 2009 LAC countries suffered a decrease of 1.9 per cent in gross national product. However, during the second semester, most countries experienced a vigorous recovery, consolidated in 2010. In South America, the decrease in gross product was only 0.2 per cent. In Central America, some Spanish and French speaking Caribbean countries registered a 0.8% per cent growth, while others registered a negative growth. Guyana and Surinam enjoyed a 3.3% and 2.2%, growth, respectively.

As reported by ECLAC (3), inflation in LAC dropped from 8.2% in 2008 to 4.6%, in 2009. With the exception of Argentina and the Dominican Republic, the rate of inflation decreased in all other countries in 2009. As in 2008, Venezuela reported the highest inflation rate in the Region (26.9%). In 2010, a slight increase in inflation was reported by all LAC countries. The contributors to this increase include: increased international food and energy prices. The suppression of subsidies to some food and oil products also contributed to this higher inflation rate.

After contracting in 2009, GDP expanded by 5.9% in Latin America and the Caribbean in 2010, albeit with the region's hallmark differences in performance from one country to another. The expansion in output was driven by strong domestic demand in the forms of both consumption and investment, and by buoyant external demand. On the domestic demand side, private consumption (up 5.9%) was sustained by an upturn in employment and wages, brightening economic expectations, an expansion in lending to the private sector and, in some countries, an upswing in remittances from emigrant workers. Public consumption rose at a more modest rate of 3.9% and investment jumped by 14.5%, with strong growth in the machinery and equipment segments in particular. On the external demand side, exports of goods and services were especially buoyant —rising by over 10%— in the Southern Common Market (MERCOSUR) countries, the Dominican Republic, El Salvador, Mexico and Nicaragua. Meanwhile, imports of goods and services increased by more than 10% at constant prices on the back of robust domestic demand within the region, which rose 7.5%. For 2011, ECLAC (5) projects regional GDP growth of 4.7%, or 3.6% in per capita GDP, as the recovery that began in the Latin American and Caribbean economies in the second half of 2009 firms up. The slippage in this rate compared with 2010 may be attributed to loss of momentum in the international economy and, in some cases, the gradual withdrawal of public policy stimulus implemented to deal with the fallout from the crisis. For 2012, regional growth is projected at 4.1%, equivalent to a rise of 3.0% in per capita GDP, notwithstanding the downturn in external conditions and, on the domestic front, complex policy challenges arising from dilemmas over the direction of certain macroeconomic variables (5).

In the short term, activity levels in the economies of Latin America and the Caribbean are being sustained largely by private consumption, thanks to an improvement in labour indicators and an expansion in lending. At the same time, expectations of buoyant domestic demand and the depletion of idle production capacity, combined with more readily available credit, are fuelling investment. The unemployment rate is projected to fall again in 2011, to between 6.7% and 7.0% —below pre-crisis levels— as continued growth boosts the employment generation capacity of the region's economies. Indicators show formal wage employment rising as a proportion of total employment in several countries, suggesting that the new jobs being created are of better quality. This setting of economic growth and jobs rising in both numbers and quality could herald fresh gains in poverty reduction (5).

2.3 Trade and Poverty

ECLAC (2), reported for 2009, a 12.9% contraction in the volume of world trade. LAC was no exemption, registering a 13.5% and 23.3% contraction in volume and in value, respectively.

The function of trade in poverty alleviation varies from country to country and from region to region. LAC is the only Region that has maintained the solid position as a net exporter of agricultural products. Some tendencies in world agricultural trade have serious consequences over small scale farmers and undernourished people (14).

The economic relations between trade, poverty and food security are complex, and national experiences in trade reform have also been diverse, and entail well differentiated elements. The first of these relations is established a border between two countries. When one country opens its trade policies, for example, eliminating import duties, this action allows a decrease in market prices at the border. The second relation, has to do with the manner in which the lower prices are transmitted to local markets inside the country, to farmers and consumers (14).

The 2004 UNCTAD report on less developed countries, analysed the relation between international trade and poverty in those countries, concluding that the potential of trade to alleviate poverty has not been materialized. Deficient trade results, weaker links between trade and economic growth and the tendency for the expansion of exports, from developing countries to be related to economic growth, are some of the reasons that explain these phenomena (14).

The UNCTAD report (14), concludes, that open markets benefit those persons living in poverty and food insecurity, acting as catalyser for change and providing conditions in which poor people can increase their income and their productivity.

The study also demonstrated open markets may also have unfavourable short term effects, while the production and labour sectors are adjusting. It also pointed out that the liberalization of national agricultural markets to international competitors, especially if they receive subsidies, before infrastructure and national marketing institutions have been developed, may have unwanted effects in the long term, on national agriculture and serious consequences on poverty and food security.

According to FAO (8), to reduce unwanted effects on poor and food insecure people and to be able to take advantage of opportunities brought forth by trade liberalization, local governments need:

- ✓ To clearly define, how trade policy is addressed in the national strategy to alleviate poverty and reduce food insecurity;
- ✓ To understand how the process of trade liberalization and in a broader sense, economic and sectorial policies, affect prices at the borders; and
- ✓ Establish and implement analytical instruments, which allow predicting, how trade policies may affect labour, local markets and distribution channels and what economic and social sectors and regions of the country will be affected.

The above strategy requires investments in rural infrastructure, human resource development and other public goods, prioritizing the needs of poor people and the long-term viability of their livelihoods. It is required to strengthen social networks to protect vulnerable groups from the impacts related to trade liberalization and to allow poor people to take opportunities offered by open markets (8).

2.4 Food Security

What is food security and what are the hunger reduction targets?	
Food Security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Household food security is the application of this concept to the family level, with individuals within households as the focus of concern.	Food insecurity exists when people do not have adequate physical, social or economic access to food as defined above.
Undernourishment exists when caloric intake is below the minimum dietary energy requirement (MDER). The MDER is the amount of energy needed for light activity and to maintain a minimum acceptable weight for attained height. It varies by country and from year to year depending on the gender and age structure of the population.	The World Food Summit goal is to reduce, between 1990–92 and 2015, the number of undernourished people by half. MDG1, target 1C, is to halve, between 1990 and 2015

In table 2, the rise in numbers of hungry people in world and LAC, are detailed. In 2010, there were almost 1.025 billion of hungry people in the world, 53 million of these, lived in LAC. The bullish world trend, beginning in 2000, is notorious, as is the recent increase in the number of hungry people, caused by the financial crisis.

Table 3. Number of Hungry People in the World and LAC

Period/year	World (millions)	LAC(millions)
1969-71	878	-
1979-81	853	-
1990-92	845	53
1995-97	825	52
2000-02	857	49
2004-06	873	45
2008	915	47
2009	1020	53

FAO (14) estimates indicate, that undernourishment and the lack of intake of vitamins and essential minerals, kill more than 5 million children every year, costing more than 220 million year of productive lives in the developing world.

A UN study, cited by FAO (14), indicates that undernourishment in children, cost in 2006, the Dominican Republic and Central American countries, 6.4% of their gross national product, this amount is likely to increase to 10% by 2015, if measures are no taken. Hunger in the United States, were more than 35 million people are undernourished live, costs more than 90,000 million dollars each year, taking into account drop in productivity, health care and the cost of food aid (14).

Table 3 and Figure 2; depict the prevalence of undernourishment in regions of the world and Guyana. The number and the proportion of undernourished people have declined, but they remain unacceptably high. After increasing from 2006 to 2009 due to high food prices and the global economic crisis, both the number and proportion of hungry people have declined in 2010 as the global economy recovers and food prices remain below their peak levels. But hunger remains higher than before the crises, making it ever more difficult to achieve the hunger-reduction targets of the World Food Summit and Millennium Development Goal 1 (15).

Improving food security in protracted crises requires going beyond short-term responses in order to protect and promote people's livelihoods over the longer term. People living in protracted crises are often forced to make radical adjustments in their way of life that requires longer-term responses. This disruption to traditional livelihoods and coping mechanisms also has very different implications for men and for women (15).

Agriculture and the rural economy are key sectors for supporting livelihoods in food crises, but they are not properly reflected in aid flows. Agricultural and rural-based livelihoods are critical to the groups most affected by protracted crises. Agriculture accounts for a third of protracted food crisis countries' gross domestic product and two thirds of their employment. Yet agriculture accounts for only 4 per cent of

humanitarian ODA received by countries in protracted crisis and 3 per cent of development ODA (15).

The current aid architecture needs to be modified to better address both immediate needs and the structural causes of food crises. The current system uses humanitarian assistance to support short-term efforts to address the immediate effects of a crisis, and development assistance for long-term interventions to address underlying causes. Areas of intervention that are important in protracted crises (including social protection and risk reduction) are often underfunded. In general, weak governance structures in protracted crisis situations condition aid allocations (15).

2.5 Caribbean Agriculture

Caribbean agriculture is currently facing substantial challenges because of the diminution and elimination of European Union preferences for major agricultural exports together with the general impact of trade liberalisation. This is reflected in the substantial decline in agricultural exports and in the overall declining performance of the agriculture sector in recent years. Additionally, rising concerns about food security in the context of high import food prices and recent external supply shocks; expectations of increased volatility of global food supplies because of climate change; and growing concerns about the negative externalities of conventional production, all point to the need for expanded but sustainable agriculture (21).

The Private Sector Commission (22) reports that in 2002 President Jagdeo of Guyana, proposed to a Caribbean Heads of Government Conference that the Region should build on its past efforts to develop a Common Agricultural Policy. He stressed that in the changed global environment, the "agricultural sector was neither providing for food security nor earning the foreign exchange to cover the Caribbean's growing food import bill." The Jagdeo initiative addresses the decline of Caribbean agriculture, caused by the emigration of people from the sector and by the removal of preferential market status for many of the Region's agricultural products. The Jagdeo Initiative is a strategy for removing constraints to the development of agriculture in the Caribbean. It builds upon past regional efforts to develop a Common Agricultural Policy, CAP and identifies ten key binding constraints faced by the sector.

President Jagdeo called upon the Inter-American Institute for Co-operation in Agriculture (IICA) and the UN's Food and Agriculture Organisation (FAO) to assist in developing a repositioning strategy for agriculture in the region.

Consequently, IICA prepared a Situation and Outlook Report for Agriculture and Rural Life in the Caribbean. This report was endorsed by Ministers of Agriculture in 2004 and became the first step for repositioning of agriculture and preparation of the initial proposal for the Jagdeo Initiative (22).

According to the Private Sector Commission (22), in January 2005, President Jagdeo's proposal was formally dubbed the "Jagdeo Initiative" – "Strengthening Agriculture for Sustainable Development". The proposal was endorsed by members of the agri-business sector, the forum of Ministers of Agriculture and the 2005 Heads of Government Conference. From 2005 to 2007, the FAO was involved in actions which led to the development of National Medium Term Investment Programmes. From these, potentially fundable investment projects have arisen. In June 2007, Caribbean Heads of Government met at a special meeting of donors and, among other actions, it was decided that the Jagdeo Initiative would be implemented over the next 18 months.

While export agriculture potentially can make a significant contribution to economic development in the Caribbean (and elsewhere), there is need for considerable re-thinking of the current model. The criteria for defining success in the contribution of export agriculture's to economic development, is no longer focused on the generation of foreign exchange and economic growth. Additional areas of emphasis now include positive contributions to employment; to a more equitable distribution of income; poverty reduction; enhanced food security; production and environmental sustainability. In pursuit of these objectives, organic agriculture is increasingly being seen as a credible alternative to conventional agriculture production and export (21).

In the Caribbean there is clearly need for a transformation of the agriculture sector that will have to include technological enhancements, both human and material; diversification into dynamic, high value and processed export products which account globally for more than 50% of agriculture exports; the creation of a product mix that enhances the incomes and life chances of the rural poor; and an export regime that continues to earn foreign exchange but pays much greater attention to issues of food security, production and environmental sustainability (21).

Agriculture is a major economic driver in the Caribbean Development Agenda (2), particularly with respect to provision of rural livelihoods, income earning – both national and foreign exchange – food supply and food and nutrition sovereignty and poverty and hunger reduction. Achieving the objectives of this agenda requires a "New" Agriculture that:

- Spans the entire agri-food chain and delivers diverse products including starches, proteins, minerals and vitamins, biofuel, and medicinal, cosmetic and nutraceutical products
- Develops direct and indirect linkages with the other productive sectors and, is market oriented
- Requires significant quantum of human capital that is technologically trained and more organized
- Is significantly driven by appropriate technological processes and measures
- Has an improved image through greater use of the media and corporate communication programmes

The “New” agriculture will expand the boundaries of traditional agriculture and thus provide a larger platform and greater opportunities and benefits to society from the agri-food sector. As the only regional agricultural institution identified in the Revised Treaty of Chaguaramas (Chapter 2, Article 21) of the Caribbean Community, CARDI has a key role in developing and promoting the “New” agriculture in the Region. In response to the concept of the “New” agriculture, CARDI has identified a number of Emerging Issues, which have the potential to improve food and nutrition security, increase investment opportunities for stakeholders along the value chain and strengthen cross-sectoral linkages. These Emerging Issues include Protected Agriculture, Herbals, Organic Agriculture and Agro-energy and this programme seeks to generate and validate technologies that facilitate the development of sustainable and competitive industries. Research and development interventions are mainly focused on Undercover / Protected agriculture, Organic agriculture and Herbals at this time (2).

Protected Agriculture is defined as the “modification of natural environment to achieve optimal growth”. This technology is being viewed as a viable option to attain a level of self-sufficiency in vegetable production. CARDI (2) is facilitating the development of a sustainable protected agriculture industry through the development and demonstration of appropriate production, handling and marketing technologies and practices. Research and development interventions were conducted in the area of protected agriculture, herbals and organic agriculture as follows:

The Caribbean, like the rest of the world, faces the challenge of the increased risk of introduction and establishment of alien invasive species due to increased travel and trade. CARDI (2) is the chair of the Caribbean Invasive Species Working Group (CISWG) which was formed out of events arising from dialogue among relevant entities within the Caribbean Basin (CARICOM and non CARICOM territories including Florida) concerned with finding a strategy for safeguarding the Region from invasive species. Other members of CISWG are CARICOM Secretariat, University of Florida, CAB International, CIRAD, FAO, IICA, PAHO, USDA APHIS,

University of West Indies and the University of Puerto Rico. Ministries of Agriculture (CARICOM and non CARICOM) also have representation.

2.6 Agro-industry

Traditionally, agriculture and industry have been considered separate sectors, given their characteristics and functions in economic growth. Agriculture has been identified as the first step to development, while industrial output has been used as an indicator for growth. It is accepted, that an appropriate development strategy, is one that allows moving from agricultural to industrial production, with agriculture providing funds for industrial development (7).

However, FAO (7) believes that this is no longer an appropriate strategy. First, the roles and functions in development have been revalued, from the perspective of contributions to the industrialization process and its relevance to sustainable development and political and economic stability. It must also be considered, that agriculture, in a sense, has become an industry in itself, as technology, vertical integration, trade and consumer preferences have evolved as the bearings adjust to the profiles of comparable industrial sectors, often characterized by complexity and wealth in diversity and scope.

The potential for agro-industrial growth in developing countries is linked to the relative abundance of agricultural raw materials and the low cost of labour. Under these conditions, the most appropriate agro-industries are precisely those that intensively use this raw materials and unskilled labourers, while keeping low the use of capital and skilled labourers, which are presumed to be scarce.

Product transformation is only one of the links in the continuous chain between raw materials and consumption. The difference of agro-industry with respect to other industries is the bio nature of the raw material. FAO (7) points out, another important of agro-industry is that in developing countries it may be one of the main sources of employment and income, providing access to food and other essential goods to vulnerable groups of the population. For this reason, it is considered an important element to achieve food security in the world.

2.7 Climate Change

Climate change is a permanent alteration in the physical variables that characterize the climate system, triggered by the large amounts of heat accumulated in the troposphere; this change goes beyond the natural variability in climate. Global warming, which is a shift of the thermal range in the troposphere and superficial marine waters to higher temperatures, is a product of a greater concentration of greenhouse gases. The greenhouse effect, it is understood as the atmosphere's

capacity to retain part of the IR energy emitted by the earth's surface and that is based on the presence of natural gases with greenhouse effect (4).

The earth has been through many cycles of climate change; however, the prevailing cycle is more intense, due to the increased quantity of heat in the troposphere as a result of human activity. ECLAC (4) reported, that as of the XIX century, the emanation of greenhouse-effect gases rose in such a way, that the earth's present temperature is the record of the last one thousand years (it has increased 0.7°C, (between, 1850 and 1899 and 2001 and 2005). At present, modifications can be observed in rainfall patterns, which accentuate hydrological cycles and extreme climatic phenomena, rise in ocean water levels and the melting of ice. This climatic change is now significantly affecting economic activities and the world's ecosystems.

Extremely intense climatic events, such as droughts, floods and rainfall variations are now more frequent and already affect crop production, food distribution infrastructure, and incidence of food crises, human health and the livelihood of people around the world; negatively affecting food security at family, local, national and world levels. It is possible, that this gradual rise in temperature and rainfall, is discontinuous, these (positive or negative) may affect the earth's adaptability to different crops and pastures for animal production; forestry and forest health; geographical distribution, productivity, and composition of marine-resource population; agricultural pest and disease incidence; losses in biodiversity; ecosystem functionality; availability of water for humans, crops, animals and aquaculture; loss of arable lands (due to salinization, acidification, erosion); human health and internal and international migration patterns (9).

Some scientists now accept that changes in agricultural production models will affect food security in two ways: 1) altering food supply at the family, local, national and world levels and 2) altering the livelihood for subsistence and access to food. Besides production, other food chain processes may be affected. Today, according to FAO (9), there is greater risk of damage to food transport and facilities, with the consequential disorganization of the food chain.

Climate change risks the world's development and MDG achievements of the past few decades and menaces agriculture and food security. Owing to the geographic characteristics and small economic size of the countries of the Caribbean, the region will be among the first to be affected by climate change, more than half of the population lives near the coast, increase in temperature, change in precipitation and rise in sea level due to human activities, will not only lead to loss of land but to

lowered prospects for economic growth as well as quality of life for its people (5). Hence, investment to face these phenomena should be a priority to sustain social and economic development. Agricultural, forest, fishing and aquaculture livelihoods; rural populations; the poor urban populations, especially those living in coastal areas and women, children, elders and the physically or mentally impaired; are particularly vulnerable to climate change. In the future, vulnerability will extend to low-income urban populations, the population without insurance or security networks, some subsistence livelihoods and some agricultural labourers (9).

ECLAC (5) indicates, that in LAC global greenhouse gas emissions which accelerate climate change are small, vast tracks of forest land are lost every year. Therefore, changes in land use and increased emissions caused by deforestation are now priority topics for the Region and the world. In 2008, 8.6% of the world's population lived in LAC countries, generating 8.2% of the world's gross world income and contributed with 12% of the world's total greenhouse-effect gas emissions. Although LAC contribution to gas emissions is small, it does not exempt the Region from its global responsibilities. On a per capita basis, LAC population contributes with more emissions than other developing regions, including China and India. Greenhouse effect-gas emissions activity, are essentially all, fossil fuel combustion (70-90% of national emissions); agriculture (10-20% of the emissions), especially animal husbandry and the use of nitrogen fertilizers; the use of cement and lime products and waste management (5-15% of the emissions).

Climate change is estimated to cost countries in the Caribbean sub-region up to 5% of annual GDP between 2011 and 2050, if actions for mitigating and adaptation are not pursued. ECLAC estimates that adaptation to the impact of climate change and the mitigation against it could cost the sub-region approximately 2 - 3 % of its annual GDP, compared to the cost of inaction which is estimated at 5% of GDP. The report highlighted the need for Caribbean countries to take urgent action by employing energy efficiency measures, improving management of natural resources, and implementing financing mechanisms that support sustainable adaptive actions. It calls for a sub-regional adaptation response and the strengthening of institutional frameworks for responding to climate change (6).

Among the approaches promoted by FAO (9), to mitigate and adapt to the effects of climate change are: develop new and improved climate models to increase knowledge; diversify livelihoods; adapt agricultural, animal forestry, fishing and aquaculture practises; improve soil and water management; improve early warning systems; develop improved disaster risk management; adjust land use and food security plans; implement cost-benefit analyses, which include risk components; promote better production practises; implement new policies and strategies in support of agricultural adaptation. However ECLAC (6) warns that premature

measures or not cost effective, risk a trade off with growth by diverting resources from more productive uses. It is important to include a cost-benefit analysis and consider the uncertainties before decisions are made.

To protect the food supply, goods and subsistence livelihoods from the impacts of climate change, measures for adaptation will need to respond to several risk factors, which are site specific. Besides risk management, dealing with climate change, entails to concentrate in modifying habits and attitudes in the medium and long term, to adapt to the gradually changing temperature and rainfall regimes.

IICA (17) reports that improved soil management practises that increase soil-water and plant-nutrient retention, may strengthen resilience, as well as increasing productivity. To satisfy the food demand, by the world's population, that will be 2,500 million by the year 2050, it will be fundamental to increase production, and yield per unit of resource used, be it time, land, water, nutrients, plant or animal. It will also be necessary to preserve crop and animal genetic resources and improve land, animal and fishing activities. Above all, with increased climate variability and less precise climate models, it will be necessary to increase water storage capacity for agriculture and water use efficiency.

Last, FAO (9) recognises that agriculture, forestry and fisheries are essential activities and a relevant topic in the climate change and bioenergy debate. Although these activities contribute to climate change, they are important agents for attenuation and adaptation. The use of biofuels (agro-fuels) to reduce carbon emissions and dependence on fossil fuels may have transcendental effects on food security and present and future land use. Climate change, combined with the increased demand for biofuels, reduce land, water and biodiversity availability for food production, and have repercussions on food price. It is therefore necessary to review synergism and compensations, to guarantee food security and conservation of the environment.

2.8 Agro-energy

Agro-energy offers opportunities but also risks. It may contribute to rural income, provide electricity and heat to rural homes and attenuate climate change by substitution of fossil fuels and reducing Carbon emissions. However, if agro-fuel production is not sustainable, their contribution to climate change attenuation may be negative.

FAO (13), data shows that the demand for liquid agro-fuels results in increased food prices. This is bad news for consumers, but it represents an opportunity for farmers that can produce and market crops for agro-fuel production. FAO also informs of the competition between food and agro-fuel crops for land, water, time

and other production resources. Then, policy makers face the difficult task to develop policies that ensure both food and energy security.

FAO (13) recognises three major factors responsible for the recent increase in demand for agro-fuels:

1. increased energy prices, in particular, that generated with petroleum products;
2. the need by importing countries to reduce their dependency on petroleum products, and
3. the responsibility to reduce the emission of greenhouse effect gases.

The potential of first generation liquid agro-fuels, to reduce greenhouse effect gases, varies from region to region and with production technology. Of commercial liquid agro-fuels presently in use, sugar-derived Brazilian ethanol is the most efficient; with an estimated 90% reduction capacity. In general, the use of agro-fuels for generating electricity and heat is more cost-efficient than when used for transport. Biogas, derived from animal waste, is another source of bioenergy, with potential use for reducing the emission greenhouse effect gases (13).

FAO (13) reports that the production of second generation agro-fuels from biomass is another opportunity for farmers in many countries. By increasing their use, may amount up to 80% in emissions. The use of biomass from forests and crop residue is now more frequent in cellulosic ethanol production. It is expected, that second generation agro-fuels will be more efficient and reduce competition for production resources. But at present, the use of most liquid agro-fuels is not commercially viable without subventions, commissions and/or import protection measures.

Agro-energy may be useful in mitigating climate change, but not if forests are destroyed to give way for producing raw materials, such as sugarcane and oil palm, for their production. The menace to food security, from increased food prices, is greater in countries where food crops or lands are used to produce raw materials for agro-fuels production, which would otherwise be under food crops. Agro-energy demands everybody's attention, but more so in low income countries with food deficit. These countries must update their energy policies, strategies and programmes and orchestrate with their agricultural agenda. It is worthwhile mentioning, that the greatest risks are faced by small-scale farmers in developing countries, while subsidised farmers in developed countries, are the ones benefitting the most from agro-energy production.

2.9 Agricultural and Educational Challenges in LAC

An analysis of the current situation in Latin American and Caribbean agricultural, allows identifying challenges faced by the agricultural and educational sectors. Among these challenges, it is worthwhile to mention the following:

2.9.1 Agriculture

1. Countries must become competitive, establishing national standards coherent with international principles, norms and guidelines for international trade.
2. Countries must become efficient, increasing productivity and quality with an optimum scale of production, implementing effective, national and international marketing and pricing, policies and strategies.
3. Farmers must acquire production, marketing and entrepreneurial competence and be linked to national and/or international markets.

To effectively address these three challenges, it is necessary to restructure the national agricultural sectors, introducing or changing guiding concepts.

- ✓ Farmers must grow what consumers demand, accessing the markets directly without intermediaries and adding value to their products, to perform as producers, transformers and marketers.
- ✓ Farmers must change their subsistence attitude to one of entrepreneurs. Small-scale farmers must organize in associations, clusters, federations, or cooperatives, to be able to take opportunity of the benefits large scale economies, becoming a proactive participant in the organization.
- ✓ Farmers' technological competence must be increased, to be able to fully benefit from innovative technology developments.
- ✓ Farmers' competence in environment and natural resource base management capacities needs to be increased, to be able to conserve and take full advantage of these resources.
- ✓ Farmers should be able to readily access information and communication technology.
- ✓ Governments must effectively address farmers' needs, developing rural infrastructure and providing on time services, such as insurance, credit, education and training, and generation and transfer, of appropriate technology and information.
- ✓ The sectorial legal frameworks need to be reviewed and updated to guarantee equity and justice.

2.9.2 Education

Higher education institution, particularly those directly related to the agricultural sector must cater to the needs of the rural populations. To address this challenge, these institutions must:

- ✓ Establish strong working relations, between the academic population (teachers, managers and students) and the agricultural labour sector.
- ✓ Identify educational and training needs of rural populations.
- ✓ Continuously update and improve the curricula, to ensure the formation of professionals with the demanded required competence, to lead the restructuring of the agricultural sectors.
- ✓ Update and improve their research and extension strategy (providing teacher and student opportunities) and capacity, to become a proactive (leading) participant in the national agricultural research and extension system.

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3 NATIONAL AGRICULTURE SCENARIOS

3.1 Geography and Climate

3.1.1 Geography

Guyana, officially the Co-operative Republic of Guyana is located on the northern coast of South America, between 1° and 9° north latitude and 57° and 61° west longitude. Guyana comprises the large shield landmass north of the Amazon River and east of the Orinoco River known as the "Land of many waters." It is bounded on the north by the Atlantic Ocean, south and southwest by Brazil, on the east by Suriname and on the West by Venezuela (31).

The country can be divided into five natural regions; a narrow and fertile marshy plain along the Atlantic coast (low coastal plain) where most of the population lives; a white sand belt more inland (hilly sand and clay region), containing most of Guyana's mineral deposits; the dense rain forests (Forested Highland Region) in the southern part of the country; the desert savannah in the southern west; and the smallest interior lowlands (interior savannah) consisting mostly of mountains that gradually rise to the Brazilian border. Guyana has one of the largest unspoiled rainforests in South America, some parts of which are almost inaccessible by humans (31).

The four longest rivers are the Essequibo at 1,010 km long, the Courantyne River at 724 km, the Berbice at 595 km, and the Demerara at 346 km. The Courantyne River forms the border with Suriname. At the mouth of the Essequibo are several large islands (31).

3.1.2 Climate

The climate is tropical and generally hot and humid, though moderated by northeast trade winds along the coast. There are two rainy seasons, the first from May to mid-August, and the second from mid-November to mid-January (31). Along the coast, the mean annual rainfall ranges from 80 to 110 inches; the mean monthly shade temperature varies from 79°F to 82°F and the daily range exceeds 14°F (1).

The following habitats have been categorised for Guyana: coastal, marine, littoral, estuarine palustrine, mangrove, riverine, lacustrine, swamp, savannah, white sand forest, brown sand forest, montane, cloud forest, moist lowland and dry evergreen scrub forests. More than 80% of Guyana is still covered by forests, ranging from dry evergreen and seasonal forests to montane and lowland evergreen rain forests. These forests are home to more than a thousand species of trees. Guyana's tropical climate, unique geology, and relatively pristine ecosystems support extensive areas

of species-rich rain forests and natural habitats with high levels of endemism. Approximately eight thousand species of plants occur in Guyana, half of which are found nowhere else (31).

Guyana has one of the highest levels of biodiversity in the world. Guyana, with 1,168 vertebrate species, 1,600 bird species, boasts one of the richest mammalian fauna assemblages of any comparably sized area in the world. The Guiana Shield region is little known and extremely rich biologically. Unlike other areas of South America, over 70% of the natural habitat remains pristine (31).

3.2 Government

3.2.1 Structure

Politics of Guyana takes place in a framework of a semi-presidential representative democratic republic, whereby the President of Guyana is the head of government, and of a multi-party system. Executive power is exercised by the government. Legislative power is vested in both the government and the National Assembly of Guyana (31).

In the general election of November 28, 2011, three major political parties participated: People's Progressive Party/Civic (PPP/C), A Partnership National Unity (APNU), and the Alliance for Change (AFC). Mr Donald Ramotar of the PPP/C formed the government. The 65 seat parliament comprises PPP/C 32 seats, APNU 26 seats and the AFC 7 seats.

3.2.2 Administrative Regions

Guyana is divided into ten administrative regions, with about 80% of the population living on the narrow coastal strip of Regions 2, 3, 4 and 6 (Table 4)

3.2.3 Demographics

In Table 3, area, population and population density of its 10 regions is presented. Guyana has an overall low population density with a high population concentration in the low coastal plain Regions (1-6).

Table 3. Regions, Area, Population and Population Density. 2011.

No.	REGION	AREA Km ²	POPULATION	POPULATION DENSITY (PER Km ²)
1	Barima-Waini	20,339	24,275	1.2
2	Pomeroon-Supenaam	6,195	49,253	8.0
3	Essequibo Islands-West Demerara	2,232	103,061	46.2
4	Demerara-Mahaica	1,843	310,320	168.4

5	Mahaica-Berbice	3,755	52,428	14.0
6	East Berbice-Corentyne	36,234	123,695	3.4
7	Cuyuni-Mazaruni	47,213	17,597	0.3
8	Potaro-Siparuni	20,051	10,095	0.5
9	Upper Takutu-Upper Essequibo	57,750	19,387	1.3
10	Upper Demerara-Berbice	19,387	41,112	2.1
	Guyana	214,999	751,223	3.5

The population of Guyana is approximately 752,000 of which 90% reside on a narrow coastal strip (approximately 10% of the total land area of Guyana). Guyana's coastal strip ranges from between 16 to 64 km in width. Approximately 85% of the population lives in urban and per urban areas; a small proportion of the population (15%) lives in rural areas, some of which are dedicated to agricultural enterprises. Hence, there are few people available as labourers or dedicated to agricultural production (1).

The present population of Guyana is racially and ethnically heterogeneous, composed chiefly of the descendants of immigrants who came to the country as either enslaved or indentured labourers respectively, from Africa and India (31). The largest ethnic group is that of the descendants of immigrants from India also known as East Indians (Indo-Guyanese), comprising 43.5% of the population in 2002. They are followed by people of African heritage (Afro-Guyanese) with 30.2%. The third in number are those of mixed heritage (16.7%), while Aborigines (Arawak, Wai Wai, Carib, Akawaio, Arecuna, Patamona, Wapixana, Macushi and Warao) are fourth making up close to 10% of the population. The smallest groups are the Europeans (including Portuguese), who number at 1,600 individuals, and the Chinese, who number at 1,400 persons. A small group (less than 1%) were unable to be classified (31).

3.3 Policy, Macro-economy and Development

3.3.1 Policy

The National Development Strategy (5) launched in 1997, set out priorities for Guyana's economic and social development for the next decade. The strategy contains a technical analysis of problems and future prospects in all economic sectors and in areas of social concern. The macroeconomic strategy put forth highlights economic growth, employment, the distribution of income, inflation, poverty and sustainability in fiscal, environmental and institutional terms. The NDS looks at the issues and constraints facing Guyana holistically, such as the level of debt, the lack of competitiveness of several of the country's export products, and

the weaknesses in the public sector. The NDS identified and has addressed, among others, the following constraints:

1. A high level of external debt.
2. Uncertainty over preferential access to rice and sugar markets.
3. A lack of competitiveness of several of Guyana's exports.
4. A need for the strengthening of the incentive regime for private sector investment.
5. Very low levels of pay in the public service, resulting in staff shortages, especially at the management level and an inadequately skilled workforce.

To address these constraints, the NDS (5) proposed five macroeconomic objectives to 1) promote continuing high growth rates of output and employment; 2) keep inflation at relatively low levels; 3) meet the population's basic needs and that the growth process contributes to a reduction in poverty; and 5) ensure that the growth path is sustainable in fiscal, environmental and institutional terms.

NDS (5) External Sector and Monetary Management main objectives were proposed to promote the growth of output and employment and to keep inflation at low levels. The NDS sought to promote the viability of the banking system while preserving competitiveness and a sound financial environment. One NDS recommendation pertinent to agriculture was the introduction of regulations to prevent credit concentration (where significant amounts are lent to a few borrowers) and the associated risk; as it increases access to credit by farmers.

Social policies were given a central place in the NDS. These policies are crucial to satisfying the national objectives of poverty alleviation, satisfaction of basic social and economic needs, and sustainment of a democratic and fully participatory society. Despite recent improvements, poverty remains a critical issue for many people in Guyana. All the proposed recommendations of the NDS are pertinent to agriculture, particularly those recommendations related to the need to promote rapid and sustainable economic growth in a labour-intensive manner, to expand employment opportunities and raise income levels; and the need to increase the productivity of the poor. For the poor to truly benefit from these employment opportunities, emphasis must be placed on formal and non-formal education and training, improved access to land for small farmers, and enhanced access to credit for micro and small enterprises (5).

In the Health Sector, the objectives of the NDS targeted improving access to quality of that health care. In Education the NDS emphasised strategies to boost the levels of literacy and numeracy in the population and improve the availability of all levels of education from pre-school care and nursery, to technical vocational education

and training (TVET), adult education and university. The environmental policies of the NDS intended to promote the sustainable management of natural resources and preserve a healthy environment in coastal, urban and hinterland regions (5).

The NDS (5) addressed the situation of Guyanese women in terms of poverty, employment, health, education, the household, and the media. Recommendations are made to tackle the higher incidence of poverty amongst women, the difficulties women face in the work place, the high incidence of domestic violence, and the specific health problems they face (including malnutrition and high maternal mortality).

3.3.2 Macro-Economy

The main economic activities in Guyana are agriculture (production of rice and Demerara sugar), bauxite mining, gold mining, timber, shrimp fishing and minerals. Chronic problems include a shortage of skilled labour and more recently of professionals; and a deficient infrastructure. In 2008, the economy witnessed a 3% increase in growth amid the global economic (32). The Inter-American Development Bank (20) reports that Guyana has experienced little economic transformation since independence and is still an agriculture and resource-based economy. Moreover, its income volatility is quite high.

Guyana's past economic performance has been closely linked to its poor export performance, showing a heavy reliance on two export products (rice and sugar) for which it is not competitive in international markets. In addition, Guyana often has been exposed to terms of trade shocks. This is likely the result of Guyana's limited export diversification toward higher-value products and its high level of dependency on oil. One of the most binding constraints to economic growth in Guyana lies in poor appropriateness of returns on private investment, which has hampered capital accumulation, innovation and diversification of the economy. The need for expanding growth sources, combined with the declining prices of the current traditional agricultural base makes it a strong argument in favour of the diversification of agricultural exports. Moreover, Guyana faces some challenges regarding the limited potential of the domestic market and the loss of the privileged access to the EU market. In this context, it becomes important to launch viable diversification strategies in the agricultural sector. By contributing to diversify the agricultural exports, this operation seeks to resume economic growth, assist in the transition of the loss of trade preferences and reduce the country's vulnerability to terms of trade shocks (20).

According to GINA (10), despite the uncertainties of the prevailing global and regional context, the Guyanese economy recorded a creditable performance in

2010. Real GDP expanded by 3.6%, the fifth consecutive year of positive growth. Significant is that the expansion in output achieved in recent years has relied less on the traditional sectors and increasingly on new and emerging sectors, with the non-sugar economy growing by 4.3%.

GINA (10) informs that Guyana's strong and sustained macroeconomic performance has encouraged increased vitality in the private sector, which is responsive to the favourable policy environment established by the Government. Foreign direct investment totalled US\$692 million in 2010, credit by the commercial banks to the private sector grew at an average annual rate of more than 15%, a total of 946 new companies were registered, and taxes paid on business profits increased by 65.5% over the past four years.

In 2011, the Guyanese economy has rebounded and exhibited moderate economic growth since 1999, thanks to an expansion in the agricultural and mining sectors, a more favourable atmosphere for business initiatives, a more realistic exchange rate, fairly low inflation, and the continued support of international organizations (31). The Guyanese economy has achieved a real economic growth of 5.9 % in the first half of 2011 and promising extremely well for the remainder of the year. This growth is a continuation of the robust performance of recent years and, in particular, building on its previous achievement of five consecutive years of positive growth since 2006. As a result of this performance, and given updated outlooks for the various productive sectors, the economy is now projected to grow by 5.1 % in 2011 with non-sugar growth projected at 3.4 %, an upward revision from the original projections of 4.6 % and 2.8 % respectively at the time of Budget 2011. The Government remains committed to maintaining macroeconomic stability and momentum in its transformational efforts, notwithstanding an often hostile global environment, is testimony to the economic resilience achieved as a result of a disciplined policy stance and sustained implementation of a sound and responsible policy framework (15).

According to the Guyana Information Agency, GINA, (10), in 2011 the Guyanese economy has an estimated gross domestic product (GDP) of \$453 billion, and is more resilient than ever before, is the result of an annual real growth of 4% on average over the past four years. External reserves now stand at US\$780 million compared with US\$277 million at the end of 2006. External debt has been reduced from 72% to 47% and the fiscal deficit from 7.2% to 4% of GDP, while the percentage of Central Government expenditure financed with domestic revenues has been increased from 60% to 81%, all over the past four years.

GINA (10) informs that in 2011, interest rates continued to trend downwards reducing the cost of borrowing for businesses. The weighted average lending rate

declined by 22 basis points to 11.95%, while the small savings rate declined somewhat more moderately by 12 basis points to 2.67%. There was also an adequate supply of foreign currency to meet demand and the market adjusted throughout the year. At the end of the year, the Guyana dollar had depreciated negligibly, by 0.12%, against the US dollar.

The cost of living in Guyana remains high. This is because most of the items used in daily life are imported with high transportation costs involved. Monopoly in some business sectors also causes higher profit booking and further rising of prices. For example, an approximate price (as of October, 2011) of gasoline (petrol) is approximately US\$ 5 per gallon, and electricity prices are close to US\$ 0.33 per unit. A domestic gas bottle (or gas cylinder) is slightly over US\$ 20. Personal income tax, which is 33.33% of total taxable income makes the cost of living higher. The October 2011 exchange rate is approximately 1 US Dollar = 200 Guyanese Dollars (27).

3.3.3 Development

3.3.3.1 Education

Table 4 shows that the expected years of schooling is 12.2, however, on the average adults only have 8.5 years of school. It is worthwhile noting that Guyana is investing 6.1% of the national GDP in education. Access to internet needs to be increased, as only 26.9% of the population is using internet (2).

Table 4. Guyanese Descriptors of Education.

Descriptors	Values
Mean years of adult schooling	8.5
% Adult literacy rate (both sexes)	NA
Combined gross enrolment ratio in education (both sexes)	83.9
Expenditure on education (% of GDP)	6.1
Expected Years of schooling (of children) (years)	12
% Internet users	26.9

SOURCE: FAO COUNTRY PROFILE

In Table 5, other basic statistics are presented. Guyana the third smallest country in South America with approximately 770,000 people has a low population density of 3.55 persons per km². Between 1980 and 2010 Guyana's HDI rose by 0.7% annually from 0.500 to 0.611 today, which gives the country a rank of 104 out of 169 countries with comparable data. The HDI of Latin America and the Caribbean as a region increased from 0.578 in 1980 to 0.706 today, placing Guyana below the regional average (2).

Table 5. Guyanese Geographic, Demographic and Socio-economic Descriptors. 2011.

DESCRIPTORS	VALUES
Total area (2)	214,970 km ²
Land area (2)	196,850 km ²
Agricultural land (2)	16,750 km ² (2% of arable land)
Population (2)	770,000
GDP 2010 (Nominal) (2)	2,215 (billions US\$)
GDP/per capita (2)	2,868 (US\$)
Human Development Index (2)	0.611
Global Hunger Index (2)	7.6
Real growth rate (3)	3.6%
Inflation (3)	12.3%
Arable land (2)	2%
Labour force (2001 estimate) (3)	418,000
Agricultural produce (2)	Sugar, rice, vegetable oils, beef, pork, poultry, dairy products, fish, shrimp.
Industrial produce (3)	Bauxite, sugar, rice milling, timber, textiles, gold mining
Natural resources (2)	Bauxite, gold, diamonds, hardwood timber, shrimp, fish
Exports (2006 estimate) (3)	US\$621.6 million; sugar, gold, bauxite/alumina, rice, shrimp, molasses, rum, timber, rice, sugar and citrus fruits.
Imports (2006 estimate) (3)	US\$706.9 million; manufactured items, machinery, petroleum, food.

SOURCES: FAO (2) and IDB (3)

3.3.3.2 Infrastructure and communications

There are a total of 187 km of railway, all dedicated to ore transport. There are 7,970 km of highway, of which 590 km are paved. Navigable waterways extend to 1,077 km, including the Berbice, Demerara, and Essequibo rivers. There are ports at Georgetown, Port Kaituma, and New Amsterdam. There is 1 international airport (Cheddi Jagan International Airport, Timehri); 1 regional airport (Ogle Airport); and about 90 airstrips, 9 of which have paved runways. Guyana and Suriname are the only two countries in South America which drive on the left (31).

According to WTO (33) a state-owned company has a monopoly on electricity transmission and distribution in Guyana, and is the largest power generator. Electricity production in Guyana is costly and unreliable, and highly reliant on imported fuel. There is no commercial production of petroleum in Guyana.

However, there is considerable potential for Guyana to increase hydroelectric generation, and start producing crude petroleum in the foreseeable future. Guyana's estimated installed power capacity is 322 MW. Around 83% of the installed capacity is thermoelectric and 17% is from bagasse-based co-generation. No electricity is currently generated from hydroelectric power. Guyana does not import or export electricity, although the authorities indicate that there have been discussions on importing electricity from Venezuela via Guyana's border with Brazil at Lethem.

The WTO (33) reported that in 2009, the average price of electricity is some G\$64.48 per kWh (around US\$0.322) (early 2009); the average price is G\$56.40 per kWh for residential customers, and G\$71.15 per kWh for industrial users. It has been observed that electricity production in Guyana is costly, inefficient, and unreliable. This is due to a large dependence on imported fossil fuels. Total losses affect around 34% of distributed power, and scheduled black-outs are frequent. Thus, much of the private sector relies on its own generators.

Efforts to diversify sources of electricity generation are under way: a number of hydroelectric feasibility studies have been undertaken; one concrete outcome was the signature of an MOU in May 2006 for Synergy Holdings to develop a 100 MW hydro-plant in 2013 to supply power to the national grid. Investigations into potential hydro-power sites in Guyana suggest that there is up to 4,500 MW of electricity generation potential from hydro-power resources within the country (33).

Key issues in the water and sanitation sector in Guyana are poor service quality, a low level of cost recovery and low levels of access. In 2008 the public utility Guyana Water Incorporated implemented a Turnaround Plan (TAP) to reduce non-revenue water and to financially consolidate the utility. NRW reduction is expected to be 5% per annum for the three-year period of the plan (31).

The WTO (33) reports that Guyana's telecommunication sector is characterized by a monopoly in fixed telephony and a de facto duopoly in mobile telephony. The regulatory framework governing the sector remains incomplete, and this affects the development of the sector and of other telecom-dependant businesses. Acknowledging the importance of addressing this problem, the Government took steps to issue new legislation in 2009.

Between 2003 and 2008, the number of fixed telephone lines grew at an average annual rate of 11.2%, reaching a teledensity rate of approximately 18%. Over the same period, the number of mobile subscriptions increased at an average annual rate of 44%, reaching a penetration rate of approximately 69 subscriptions per 100 inhabitants. In 2005 there were 10,120 main telephone lines and 281,400 cellular

telephone lines. The fixed-line teledensity was approximately 15 %; many areas still lack fixed-line telephone services. Mobile-cellular teledensity reached 37 % in 2005 (18). In 2005, penetration rates for internet subscribers and internet users were estimated at 6.4% and 18.1%, respectively. Broadband internet service was estimated to cover less than 1% of the population in 2008, which represents a relatively slow and limited adoption of this technology (33).

There are six radio broadcast stations; three AM and three FM. Guyana possess an INTELSAT station over the Atlantic Ocean. Television broadcast was officially introduced to Guyana in 1991. By 1997 there were 15 channels (1 public station; 14 private stations which relay on US satellite services. Satellite television services are offered by DirecTV Caribbean. GT& T commissioned new fibre optic cable linking Guyana to Trinidad and Suriname and increased bandwidth for internet connectivity; new fibre optic line being installed from Brazil to Guyana and will be dedicated to e-Govt; One Lap Top Per Family (OLPF) Project (18). In 2008, the communication (including telecommunication) and transport sectors together contributed 13.2% to Guyana's GDP (31).

3.4 Agriculture, Fisheries, Forestry and Agro-industry

Guyana's vast tracts of productive land present enormous opportunities for growth. Indeed, agriculture already represents a significant proportion of Guyana's domestic production (approximately 25 % of GDP) and agriculture exports amounted to over a third of Guyana's total exports in 2004. While about 90 % of Guyana's 2005 agriculture exports consisted of rice or sugar products, the value and share of processed goods and fresh fruit and vegetable exports have experienced a positive growth trend in recent years. This is a result of efforts by the Government and the private sector to diversify Guyana's agricultural sector. With the right investments, Guyana could easily become the 'breadbasket of the Caribbean' while at the same time increasing exports to markets in North America and Europe (12).

3.4.1 Agriculture in the National Development Policy

The NDS (5) allocated priority to agriculture as the single most important sector of Guyana's economy; more that 70% of Guyana's population live in rural households and are primarily dependent on income generated from agriculture and related activities.

The sugar industry has played important social and economic roles within Guyana and is the largest single employer in the country (5). The NDS recommended to: increase efficiency and competitiveness, particularly important given the inevitable reduction in the preferential prices received through the European Union; invest in

the modernisation of the industry and reduce recurrent production costs; pursue policies to improve the sector's efficiency and competitiveness; and strategies to enhance the financing, management and efficiency of the sector, such as through a participatory privatisation involving workers.

Rice is Guyana's second major crop and a major source of income, employment and foreign exchange. Despite improvements since the late 1980s, the rice sector continues to face a number of constraints that hinder its development (5). The NDS makes the following suggestions to address problems such as, the lack of competitiveness on the international market, inadequate access to credit and land (especially for small farmers), and institutional weaknesses. The NDS called to strengthen the Guyana Rice Development Board; to reinvest the benefits from Guyana's preferential export markets back into the rice sector to improve competitiveness; and to increase productivity and promote technology development by. The NDS also called for research based on market demands and the experiences of farmers, to assess productivity, yield variability, pest control, and the development of characteristics demanded by the export and domestic markets.

In Guyana, non-traditional crops are labour intensive and generate substantial levels of foreign exchange. Promoting the output of this sector will, therefore, increase rural incomes, employment and foreign exchange earnings, and reduce rural poverty (5). The NDS recommended to: develop land and infrastructure; focus research on selected commodities and geographic zones based on marketability and production potential; to improve plant protection and quarantine; establish information centre to assist farmers; encourage sector involvement in agricultural extension; increase access to credit by farmers; to establish an advisory services agency that informs farmers of market opportunities, assists in finding inputs and obtaining access to markets, and directs farmers' concerns to relevant agencies. One option is marketing centres managed by the private sector; and introduce strategies to promote livestock nutrition and health, including the development of energy based and protein feeds production; improvement of the productivity of saline and acid soils to ensure adequate pasturage; and strengthening of abattoir and veterinarian services, financed partly by cost-recovery measures. The NDS also recommended to promote rapid growth through improvements in the efficiency of land resource use, and to support poverty alleviation by increasing access to land for the landless and small rural farmers.

3.4.2 Sectorial Policies and Legislation

Several initiatives are being pursued to achieve a new agriculture vision for Guyana, based on the Jagdeo Initiative, which identified and defined key constraints facing agricultural development in the Caribbean Region. The new agriculture vision is aimed at moving the sector from just the production of food or raw materials, by exploring opportunities in agri-business which can create more employment, increase export earnings and the income of all stakeholders, especially those of farmers. In pursuing the Jagdeo Initiative, several interventions were made by the Government of Guyana to help achieve the country's agricultural potential. At present a chain of activities is being undertaken in this direction. This includes the new extension services programme that entails several components aimed at aiding cultivation and production, implementation of new technologies and research (29).

The Government of Guyana defined the objective for the agricultural sector in its National Development Strategy 2001-2010, is to increase the rate of growth of its output. It states that agricultural export diversification will contribute to Guyana's growth through higher value-added products (20).

3.4.2.1 Agriculture and Livestock

The Ministry of Agriculture has undertaken many initiatives to ensure that Guyana stays on a sustainable growth path of being food-secured. These include the Grow more Food Campaign and the Agriculture Export Diversification Programme. In October 2011, the MOA launched the Food and Nutrition Strategy for Guyana. The implementation of a successful food and nutrition security strategy for Guyana will impact every aspect of the local economy. Ensuring that the country, in the long term, is food-secure will make possible the achievement of other national and international development goals. The overall goal of this strategy is "to improve the health and well-being all persons living in Guyana through enhance food and nutrition security" (13, 24).

The MOA approved in 2006 an Agricultural Diversification Strategy that adopts a system or cluster approach to export development and to contribute to a friendly business and investment atmosphere. Guyana has been building its institutional assets to promote agricultural non-traditional exports such as the Fisheries Act (2002), Animal Movement and Disease Prevention Act (2003), the Pesticides and Toxic Chemical Regulations (2000), the Veterinarian Act (2003), and the Drainage and Irrigation Act (2005) (13,20,24).

In 2011, the diversification of agriculture continues to be one of the principal pillars of the strategy to broaden the productive base of the economy. The Government continues to focus on the implementation of the strategic plans for the four main production clusters, namely fruits and vegetables, livestock and aquaculture. In this regard, through an IDB project, measures have been taken and investments made to provide institutional strengthening, capacity building, credit facilities, improved physical infrastructure and the upgrading and enactment of rules, regulations and legislation for the efficient operations of the plant, animal and food safety agencies. To streamline the sector, several functional bodies were consolidated. This resulted in the new National Agricultural Research and Extension Institute (NAREI) and the Guyana Livestock Development Authority (GLDA) being established (10). In addition, the Government continued to facilitate large scale agriculture, including in the intermediate savannahs, in which a number of investors have already indicated interest.

GINA (10) informs that in 2010, a total of \$1.3 billion was spent to expand the non-traditional production sectors. Activities included the rehabilitation of the seed production facility, the germplasm laboratory and the library, provision of equipment for NAREI, and acquisition of refrigerated trucks and containers for the new Guyana Marketing Corporation (GMC), aiming at boosting available supplies of non-traditional crops for the export market. In addition, under the Rural Enterprise and Agricultural Development (READ) programme, over 1,000 farmers were trained in areas such as food processing, feed formulation and pest and disease control.

According to GINA (10) in 2011, the Government accelerated the diversification and modernisation of the agricultural sector with a budgetary allocation of \$1.5 billion. In this year, two financial facilities were established to provide funding to benefit qualified producer groups, for improvements to their farming systems and processing activities. Under READ, the facility will primarily be used for investment purposes including purchasing small farming and agro-processing equipment, land clearing and preparation works, building works and purchase of breeding animals. The Agriculture Export Diversification Programme (AEDP) credit facility targets individual farmers, as well as farmers' associations on a larger scale, providing required infrastructure and equipment, in an effort to boost value-added interventions, improve business environment, encourage private sector involvement and create competitiveness within this sector. Also in 2011, the Government enacted a new plant, animal and food safety legislation and upgraded regulations for pest and disease control, for import and export (10).

3.4.2.2 Fisheries and Aquaculture

The NDS (5) aimed at maintaining and improving the nutritional, social and economic benefits from the fisheries sector in a sustainable manner. The following recommendations included: 1) support for artisanal fishermen by improving cold-storage and processing facilities and the marketing system; 2) strengthen Guyana's fisheries management system to promote a sustainable use of fish stocks, improve the enforcement of regulations, accurately assess current stocks, enhance the extension system and improve quality control to strengthen export potential; 3) focus efforts on deep water finfish, and introduce strategies to limit fishing of marine prawn and seabob to sustainable levels; develop a policy for the long-term development of the aquaculture sector, which is the sub-sector of fisheries with the greatest potential for expansion of production, creation of employment, and generation of foreign exchange and 4) improvements in access to freehold land or secure leases for the expansion of aquaculture activities in shrimp production may be an important way to sustainably manage shrimp populations, and maximise their export potential.

The Ministry of Agriculture is responsible for the formulation and implementation of fisheries policy in Guyana, following the merger of the Ministry of Agriculture and the Ministry of Fisheries, Crops and Livestock. A Fisheries Advisory Committee comprising representatives from the public and private sectors was reinstated in 2007 to advise the Minister on all fisheries issues. The main legislation regulating the sector is the Fisheries Act No. 12 of 2002. There have been no recent changes to this law. The Act provides for the registry of fishing boats with the Chief Agricultural Officer, the inspection of vessels and the licensing of fishing operations, both domestic and foreign. Foreigners may obtain a licence to engage in fishing if they set up a local company, or if they engage in test fishing. There have been no changes to the Maritime Boundaries Act Cap. 100:01, of 1977, which establishes a territorial sea and a fishery zone that, extends 200 miles out from the baseline of the territorial sea (33).

Guyana grants tax exemptions to assist the industry. Certain fishing inputs are zero-rated under the VAT Act: ice for fishing purposes; fishing nets; and fish hooks, sheet lead, fishing floats, cotton, and Styrofoam for use in the fishing industry. In addition, under the Customs Act, fishing boats, spare parts and equipment for fishing boats, and fishing equipment for use in the fishing industry are exempt from customs duties. There is no Government assistance to the fishing industry in the form of grants and loans (33).

Efforts have been made to develop the aquaculture industry in Guyana with the encouragement of the Government. National Aquaculture Association of Guyana

(NAAG) was formed in 2006 as a forum for public and private stakeholders to steer the direction of the industry, to facilitate donor financing, and provide extension services to its members. In addition the Ministry of Agriculture has been involved in developing infrastructure for the industry. The authorities indicate that there are no limitations to foreign investment in aquaculture. The first commercial quantities of aquaculture exports to the United States were in 2007 (5).

The Fisheries Department at the MOA (22) was established to manage, regulate and promote the sustainable development of the nation's fishery resources for the benefit of the participants in the sector and the national economy. The Department is responsible for ensuring the observance of all legal and administrative requirements by all entities in the Fisheries Sub-Sector and to recommend changes or new regulations when necessary.

Fisheries in inland waters have long provided an important source of food to mankind; however, their importance relative to other production systems has been declining over the past decades. Contributing to this diminished importance have been the far reaching changes to the aquatic environment arising from human activities such as damming, navigation, wetland reclamation for agriculture, urbanization, water extraction and transfer, and waste disposal. The rising demand world-wide for water and for the services it can provide is placing pressure on all uses of this resource with a corresponding need to rationalize and intensify individual sectors while ensuring their harmonious integration. As the MOA (22) points out, the multi-purpose nature of use patterns in inland waters creates a very distinct climate for the development and management of fisheries which, in the past century or so, becomes one use among many and very often, one of the least significant in terms of financial yield. Management therefore should be conducted in a climate of compromise with other users and depends as much on regulations governing their activities as those governing the fishery itself. In other words inland fishery managers are rarely in control of the resource they manage. Because of this the code must be interpreted to inform and involve sectors other than fisheries.

The FAO Technical Guidelines for Responsible Fisheries has been considered for the development of an inland fisheries policy for Guyana. The guidelines have no formal legal status. They are intended to provide general advice in support of the implementation of Articles of the Code of Conduct for Responsible Fisheries pertinent to the development and management of inland fisheries (22).

3.4.2.3 Forestry

The forest industry represents vast economic potential for Guyana. The NDS recommended to: increase the economic benefits derived from the forests; improve

the sustainability of the sector; and spread the benefits of forest-based development to Guyana's rural areas; review of forest fees; develop a policy framework for concessions that will make the process more transparent, protect the rights of the investors and enable the enforcement of their obligations; encourage labour-intensive wood processing industries through fiscal incentives and strengthen and streamline the Guyana Forestry Commission (GFC). The NDS also recommended granting the GFC more autonomy with regards to raising revenue (5).

The Government of Guyana continuously updates policies and laws relating to the conservation, management, protection and sustainable development of forest resources. This initiative began with the drafting of the National Development Strategy in 1996. The Strategy provides guidance for the development of the forest sector by identifying national development objectives and constraints. The first National Forest Policy was prepared and finalised after two years of broad consultation with the industry and other sector interest groups. In 2001, the Guyana Forestry Commission responded to the requirements of the National Development Strategy with a programme for the formulation and implementation of policies, strategies and action plans for the forest sector (9).

The GFC (9) coordinated the revision of the National Forest Policy Statement and the National Forest Plan in 2010, through a series of consultations involving wide stakeholder involvement. This revised Forest Plan therefore embodies ideals for enhanced development and wider opportunities for the management of Guyana's forest estate. Programme areas of the Plan have expanded to address new dispensations such as the Low Carbon Development Strategy (LCDS), increased value-added production, additional guidelines for sustainable forest management (including non-timber forest products), improvements in marketing strategies, meeting training and human resource capacity needs, ensuring community development are satisfied, and forest resources equitably shared; all of which are enshrined in the National Forest Policy Statement.

Hence the National Forest Plan provides the framework through which the National Forest Policy is implemented and therefore requires periodic update to complement changes in the policies governing the forest estate. The Plan comprises several programme areas which are executed through a number of activities, many of which are long-term and continuous, whilst some are more short term (9).

The overall objective of the National Forest Policy is: the conservation, protection, management and utilisation of the nation's forest resources, while ensuring that the productive capacity of the forests for both goods and services is maintained or enhanced. The specific objectives are: (a) to promote sustainable and efficient

forest activities which utilise the broad range of forest resources and contribute to national development while allowing fair returns to local and foreign entrepreneurs and investors; (b) to achieve improved sustainable forest resource yields while ensuring the conservation of ecosystems, biodiversity, and the environment; (c) to ensure watershed protection and rehabilitation: prevent and arrest the erosion of soils and the deforestation and degradation of forests, grazing lands, soil and water; promote natural regeneration, afforestation and reforestation; and protect the forest against fire, pests and other hazards; (d) identify, quantify and assist in the marketing of environmental services to generate forest incentives for national development (9).

To support the implementation of the forest policy, the GFC (9) reviewed existing forestry legislation and prepared a new draft Forests Act. The purpose of the new Act is to reform the law relating to the management of forest resources, to provide for sustainable management and to consolidate provisions of predecessor legislation. The new legislation provides for: (a) the conservation of the forests of Guyana, including measures to conserve biodiversity, special species and habitats, soil and water resources, and to protect forests against pollution, fires, pests and diseases; (b) the participation of interested parties, including Amerindians, local communities, non-governmental organizations and persons engaged in the commercial utilization of forests, in the development and implementation of forest policies; (c) the sustainable use of Guyana's forest resources, in accordance with Guyana's development needs and level of socio-economic development, pursuant to national policies; (d) the integrated and comprehensive regulation of the multiple and complementary functions and uses of the forests of Guyana, including traditional uses; (e) the promotion and regulation of primary conversion, secondary and tertiary processing activities, including the use of environmentally sound technologies and the facilitation of market access for value-added forest products; and (f) the discharge of Guyana's responsibility to ensure that activities within its jurisdiction or control do not cause damage to the environment of other States or areas beyond the limits of national jurisdiction. Specifically, the (Forest Act 2009) provides for (a) sustainable forest management of State forests; (b) protection and conservation of forests, including measures to – (i) conserve biological diversity; (ii) protect specific trees and plants; (iii) conserve soil and water resources; and (iv) protect forests against degradation, fires, pests, and diseases, (c) the regulation of forest operations and activities relating to forest produce; and quality control of value-added forest produce.

3.4.2.4 Climate Change and LCD

Climate Change

Adaptation policy is in many cases an extension of development policy that seeks to eradicate the structural causes of poverty and food insecurity. The complementarities between the two will enable a streamlined approach towards achieving both adaptation and poverty alleviation goals. General policies that should be supported include those: promoting growth and diversification; strengthening institutions; protecting natural resources; investing in research and development, education and health; creating markets in water and environmental services; improving the international trade system; enhancing resilience to disasters and improving disaster management; and policies promoting risk-sharing, including social safety nets and weather insurance. Adaptation options and their supporting policies should be adopted by the appropriate level of government and implemented by institutions in direct contact with beneficiaries (4).

Guyana is a net sink for greenhouse gases but will be affected by the impacts of human induced climate change. In recent years, there have been increases in the frequency and severity in weather related events in Guyana which may be linked to climate change (25).

According to MOA (25), changes in climate will affect Guyana's agricultural sector. In addition, fisheries are also likely to be affected as species migrate relative to the change in the oceans' temperature. Climate Change is expected to cause an increase in some diseases; resurgence in others and an increase in pest populations. As the climate warms, pest species such as mosquitoes are able to move into previously cooler areas. Climate change could lead to the extinction of some key plant and animal genetic resources: some plants will not be able to adapt to this rapid change in the climate and will die off breaking key links in the food chain. This will affect other species that depend on them for survival. Climate Change will increase Guyana's demand for energy: as the days get hotter and the climate creates more extreme weather we will require more energy to keep cool and to drain and irrigate lands. The cost of adaptation and mitigation of climate related activities will require the allocation of a significant portion of the country's budget, in addition to the cost created by weather related disaster.

MOA (25), believes that adaptation to climate change is vital. The change in the world's climate is already taking place largely due to warming. The impacts are already occurring and will worsen in the future. Adaptation as defined by United Nations Framework Convention on Climate Change (UNFCCC) is "an adjustment in natural or human systems in response to actual or expected climatic stimuli or their

effects, which moderates harm or exploits beneficial activities". In simple terms, adaptation is action taken to deal with the impacts due to a changing climate, e.g. this would include increased rainfall, higher temperatures, rise in sea levels and more frequent storms.

A study by GTZ (4) indicates that agricultural research, including crop breeding to develop drought and heat tolerant crop varieties, will require both public and private investment. Structural adaptation measures, such as creating water markets and price incentives, will need to be implemented on a national level, most likely in partnership with economic cooperation unions.

Mitigating climate change is essential for any country. Mitigation is one of the two fundamental approaches in the international climate change process. Mitigation activities complement adaptation and can be implemented together by countries to address the effects of climate change. Actions at an early stage to reduce greenhouse gas (GHG) emissions will ease the need for future adaptation and reduce the impact on those most vulnerable. Mitigation entails reducing the six main Greenhouse gases, through the application of technologies and other methods, or using specified techniques, such as soil sequestration, reforestation, etc. to increase the re-absorption of Greenhouse gases in particular, carbon dioxide (25).

Guyana has developed the National Climate Change Action Plan outlining, among others, key actions to be undertaken to reduce emissions by sector. Noticeable is the investment in renewable energy such as hydro power and wind, demand side management to improve energy efficiency, energy conservation, energy efficient lighting; improved farm practices such as using legumes/grasses in crop rotation, mulching, agro-forestry and the use of cover crops. The main sectors in Guyana for any notable reduction in greenhouse gas emissions are Energy, Agriculture and Waste (25).

The Government of Guyana has identified actions to be taken in various sectors to mitigate the impact of climate change (25); these are:

Energy supply: Investment in renewable energy, switching from fossil fuels to other renewable energy sources such as hydro power and wind.

Buildings: Use of high efficiency lighting and appliances in homes, efficient ventilation and cooling system and adequate insulation.

Transport: Use of biofuel as a petrol replacement, and more fuel efficient vehicles.

Industry: More efficient end-use electrical equipment, heat and power recovery, material recycling and substitution.

Agriculture: Improved crop and land management, improved rice cultivation techniques, livestock and manure management and improved energy efficiency.

Forests: Avoided deforestation, reforestation, afforestation, forest management and harvested wood product management.

Reducing Emissions by Sector

Agriculture: Promote carbon sequestration, improved fertilizer management, improved crop varieties, diversification of crops, manure management, organic farming and protection and re-planting of mangroves. Through the Low Carbon Development Strategy (LCDS), mitigation initiatives are pursued also in the above mentioned areas (7).

Land Use & Forests: The Forestry sector practices sustainable logging which reduces the number of trees logged and prevents clear cutting and deforestation. The Guyana Forestry Commission has also set up a Reduced Emissions from Deforestation and Forest Degradation (REDD) Secretariat. REDD programs are implemented in close collaboration with the Office of Climate Change and the LCDS. Guyana's greenhouse gas emissions level is minimal when compared to its potential to absorb carbon dioxide. Therefore, Guyana has been promoting its forests as a net sink at the international level through the 'Avoided Deforestation' mechanism (7).

As a Non-Annex 1 country, Guyana has specific commitments under the UNFCCC. These are (25):

- Develop, update and publish national inventories of emissions sources and sinks of all greenhouse gases.
- Promote sustainable management and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases.
- Cooperate in preparing for adaptation to the impacts of climate change.
- Include climate change considerations into relevant social, economic and environmental policies with a view to minimizing the adverse effects of climate change.
- Promote and cooperate in education, training and public awareness related to climate change.

- Communicate to the Conference of the Parties (COP) information as required by the UNFCCC.

There will be an important role for public policy in assisting adaptation to climate change. Planning for adaptation and implementing the targeted adaptation policy by the Government will require resources beyond its capacity. In addition, lack of awareness or reluctance by the population to take action presents serious barriers to adaptation. Incentives and investments will be necessary for creating and diffusing improved technology and management techniques.

Low Carbon Development Strategy

The Low Carbon Development Strategy (7) sets out Guyana's view on how such a platform for partnership can be created, and affirms our commitment to play our part. This strategy document sets out Guyana's view on how such a platform for partnership can be created, and affirms our commitment to play our part.

There has been increasing global recognition of the fact that protecting forests is essential to the fight against climate change – deforestation and forest degradation contribute about 17% of global greenhouse gas emissions. As a consequence, the conditions under which long-term forest protection might align Guyana's interests with global needs to combat climate change have become clearer. Through a well-designed and funded Reduced Emissions from Deforestation and Degradation (REDD+) mechanism, Guyana will be able to decide whether to place its forest under long-term protection by establishing a voluntary cap on forest-based greenhouse gas emissions. This would frame new economic choices for Guyana. It will make forest protection an economically rational choice by placing a value on Guyana's forest (EVNREDD+) which is in excess of EVN. Integrated land use decisions would factor in the EVNREDD+ opportunity cost, and this can change today's economic paradigm to make Guyana's forests worth more alive than dead (7).

Through this initiative, Guyana will invest in creating a low deforestation, low carbon, climate resilient economy where:

- Guyana can avoid cumulative forest-based emissions of 1.5 giga-tonnes of CO₂.
- REDD+ payments can enable Guyana's economy to be realigned onto a low-carbon development trajectory. Guyana can generate economic growth, while simultaneously eliminating approximately 30% of non-forestry emissions through the use of clean energy.

At the national level, Government has been able to further advance the LCDS and start implementation of the Guyana-Norway Agreement. In 2010, important progress was made with our bilateral and multilateral partners towards building an innovative model for payment for forest climate services. The LCDS poses challenges to both agriculture and agricultural education. Agricultural research must generate information and technology to adapt production systems and make these more compatible with the strategy; the extension service has the task to inform and educate farmers; and agricultural educational institution must form professionals with appropriate competences to lead the implementation of the strategy, this entails the incorporation into the curricula, strong natural resource management content (7).

3.4.2.5 Agro-industry

According to the WTO (33), although sector assistance to manufacturing appears limited in absolute terms, some activities potentially receive significant effective protection due to the availability of import duty exemptions for inputs. Despite this, the manufacturing sector remains small and largely focussed on the processing of primary products. In 2008, manufacturing including food processing contributed 6.7% to GDP. Guyana is a net importer of manufactured goods.

The manufacturing sector has largely been focussed on processing traditional agricultural products such as rice and sugar and forest products. There has, however, also been a recent drive to develop export-orientated manufacturing industries, taking advantage of preferential access to third markets. New areas include: garment and apparel manufacturing; value-added forest products; agro-processing; packaging, leather crafts; ceramics; and construction materials (33).

The Industry Department of the Ministry for Tourism, Industry and Commerce is responsible for promoting industrial development and the management of industrial estates with the overall aim of encouraging investment in manufacturing. The Guyana Manufacturing and Services Association, a private organization, provides policy advocacy, marketing, and technical assistance to manufacturing firms (33).

The WTO (33) informs that the average applied MFN tariff rate for the manufacturing sector, defined in accordance with the International Standard Industrial Classification, was 11.3%, just under the average protection afforded to the economy as a whole. Under the Customs and Excise Act, manufacturing inputs that undergo a substantial transformation or change in their essential character are exempt from import tariffs. Guyana offers tariff concessions on inputs used in a number of approved manufacturing activities. To assist the development of the manufacturing sector, the Government offers various specific tax incentives for the

production and export of manufactured goods, in addition to horizontal incentives offered.

3.5 Economy and Markets

3.5.1 Economy

Davidson (1) reminds us that agriculture in Guyana has historically been an industry of major importance, dominating the contribution to the country's GDP. Of the country's 21.5 million hectares, about 500,000 are arable land. During the pre-independence period (1952-1960) agriculture's contribution to the GDP averaged 23% approximately, compared to the post-independence period 1982-1990) of approximately 25%. Other contributions of agriculture include:

1. Providing food and fibre
2. Supplying the nutritional needs of the population
3. Earning and conserving foreign exchange
4. Providing a nucleus of capital formation
5. Releasing labour to other industries
6. Producing linkages between agriculture and other industries

The coastal plain where most of Guyana's agricultural production occurs represents approximately 5 % of the total arable land. Much of this fertile land lay more than one meter below the high-tide level of the sea and had to be protected by a system of dikes and dams, making agricultural expansion expensive and difficult. The sea wall system, which prevents floods at high tide, is in danger of collapse due to lack of maintenance and wave damage during storms. Repairs to the sea wall are critical, and the immediate action program will cost about US\$36 million, a large sum relative to the Guyanese economy. Guyana's remaining land area is divided into a white sand belt, which is forested, and interior highlands consisting of mountains, plateaus, and savannah, 2% of the land is arable land (30).

The country's drainage and irrigation systems are in need of repair and currently are poorly managed. The divestment of state-owned land and the provision of adequate land titles to privately owned farms is a daunting but essential task if the market system is to raise agricultural productivity (30).

Today sugar and rice are still the most important primary agricultural products, as they have been since the nineteenth century. Sugar is produced primarily for export whereas most rice is consumed domestically. Sugar production generates the highest revenue in the primary industry, ranging from 28 to 32% of the total annual GDP. Other important crops include, bananas, plantains, coconuts, peanuts,

coffee, cocoa, citrus fruits, pepper, and pumpkin and livestock commodities including beef, pork, poultry, dairy products, fish, and notably shrimp. Small amounts of vegetables, vegetable oil and tobacco are also produced. Many of these products, including rice, are of extreme importance to national food security. Guyana has achieved a high level of food security and has the capability to export food crops (5). Only 15% of Guyanese work in agriculture. Guyana has food self-sufficiency and exports food products and 21% of its GDP derives from agricultural production (2).

In table 6, details production and value of the main agricultural products are provided as estimated by FASOSTAT (3). Sugarcane and paddy rice in 2009 were the most grown crops in Guyana and generated the largest agricultural income, US\$ 148,665,000 and G\$ 82,684,000, respectively. Livestock production is headed by chicken meat, fresh whole milk and cattle meat, generating G\$ 32,900,000, G\$ 12,731,000, and G\$ 4,726,000 respectively. Fruit and crops are becoming important income generating alternatives, particularly coconuts which in 2009 generated G\$ 5,633,000.

Table 6. Agricultural Production in Guyana. 2009

COMMODITY	PRODUCTION	
	\$000	tonnes
Paddy rice	148,665	553,500
Sugar cane	82,684	2,766,000
Chicken Meat	32,900	-
Fresh whole cow milk	12,731	40798
Coconuts	5,633	77,930
Cattle Meat	4,726	-
Mangoes, mangosteens, guavas	2,054	3,428
Roots and Tubers	1973	14,424
Bananas	1,798	6,385
Fresh tropical fruit	1,754	4,292
Cassava	1,502	17,972
Sheep Meat	1,496	-
Green beans	1,271	3,576
Pork meat	1,150	-
Oranges	1,105	5,717
Pumpkins, squash and gourds	1,089	6,210
Peanuts with shells	1,049	2,412
Okra	980	1,532
Cherries	925	728
Green chillies and peppers	913	1,939

SOURCE: FAOSTAT 2011

Agriculture is the most important sector of Guyana's economy, accounting for approximately 32% of GDP, 30% of employment, and 40% of export earnings.

Sugar and rice, with privileged access to the European Union (EU), account for 74% of agriculture's GDP as well as 65% of total agricultural exports, including shrimp and timber. About 75% of Guyana's sugar production is exported to the EU at prices more than double the world market prices (20).

Agriculture maintains an upward growth trend (Table 7). Sugar and other crops, are the main contributors within the agricultural sector, followed by fisheries, rice and livestock. In 2011, the contribution of agriculture to the GDP is estimated at Guyanese dollars \$67,568,000, whilst mining is expected to generate 29,905,000 (10).

Table 7. Gross domestic product (GDP) at 2006 prices by industrial origin

INDUSTRY	REBASED 2007	REBASED 2008	REBASED 2009	BUDGET 2010	REVISED 2010	BUDGET 2011
	G\$ millions					
SECTOR	63,131	61,280	62,060	65,470	62,368	67,568
SUGAR	15,730	13,358	13,794	16,527	13,037	17,642
RICE	6,613	7,311	7,974	7,611	8,009	8,398
O. CROPS	13,345	14,313	14,508	14,813	14,871	15,168
LIVESTOCK	7,263	7,887	8,134	8,368	8,046	8,046
FISHING	9,649	9,483	8,488	8,531	9,113	9,152
FORESTRY	10,331	8,927	9,161	9,619	9,292	1,162
MINING	32,196	32,166	31,233	32,543	29,078	29,905
NATIONAL*	281,335	286,896	296,417	309,329	307,198	321,290

*The national total comprises contributions of other sectors not included. Source: GINA

GINA (10) reports indicated that in 2010, there was favourable expectation that from implementation of the turn-around plan for the sugar industry would start to manifest themselves. The projected increase in output was premised on expansion in acreage under cultivation and gains being made in productivity. Disappointingly, these results remain elusive, and the industry ended the year with final production of 220,862 tonnes, 5.5%t lower than in 2009. Performance in the rice sector was moderate, given the exceptional level of output in the preceding year. Instead, the industry continued its stellar performance, ending 2010 at 60,996 tonnes representing 0.4% growth in value added over the previous year, and causing 2010 to displace 2009 as the year in which the industry produced its second highest output since rice production commenced and its highest output in over a decade.

The other crops sector grew by 2.5%, a performance which reflects the effectiveness of Government's Grow More Food Campaign. The livestock sector, on the other hand, declined in production by 1.1% in 2010. This was mainly as a result

of an unanticipated shortfall in poultry production during the first half of the year. The fishing sector also rebounded in the second half of 2010, to end with 7.4% growth, as harvesting activity accelerated as the year progressed. The management of the forestry sector continues to occupy some prominence especially in view of Guyana's policy initiatives under the Low Carbon Development Strategy (LCDS). The sector recorded modest growth of 1.4% for the year, reflecting increased production of logs, lumber, sawn wood, and plywood, even though plywood production ceased towards the end of the year due to boiler damage at the plywood plant (10).

In the first half of 2011, \$680M were disbursed of the allocated \$1.5 B to the agriculture sector for 2011 to ensure that planned programmes and policies were implemented for the sector's advancement, with the aim of promoting and developing the non-traditional subsectors. Accordingly, a credit facility was also launched under the Rural Enterprise and Agriculture Development programme (READ), to further provide support to producers, with the aim of expanding their productive capacity. Farmers of Community Based Organizations have since benefitted from training exercises as well as preparation of business plans (26).

The small credit facility which falls under the aegis of the Agriculture Export Diversification Programme (AEDP) has allowed farmers to secure funds for the expansion of farming activities, while business plans prepared for the three cluster groups (fruits and vegetables, livestock and aquaculture), will become operational shortly. Livestock farmers have also benefited from improved services with the construction of a genetic bank for the National Dairy Development Programme while rehabilitation works to control structures and access roads at Canals Polder have also been moving apace. While rehabilitation work to the germplasm laboratory at the National Agricultural Research and Extension Institute (NAREI), has been completed; the procurement process for field, inspection and laboratory equipment is proceeding for the operationalization of the facility (26).

The MOA (26) reports that in the first half of 2011, the sugar industry showed tentative signs that the path to recovery has commenced (Table 8). The sector returned a 2011 first crop of 106,871 t, reflecting a 30.5 % increase over the first crop of 2010 and the best first crop performance since 2004. The sector's projected growth for the full year remains unrevised at 35.3 %.

The rice industry continued its successes of recent years into the first half of 2011, coming off a remarkable production performance in 2010. The 2011 first crop rice production at 207,514 t was 23.3 % higher than the corresponding period in 2010 and the highest first crop in the industry's history (Table 8). This growth in production was attributed mainly to significantly improved drainage and irrigation

as a result of government investments, the development of a new and more tolerant rice strain by the Guyana Rice Development Board, higher yields and, most importantly, a higher acreage of paddy planted.

Other Crops- grew by 3% (26)

According to reports of the MOA (26) the other crops sector continued to benefit from Government's Agricultural Diversification Programme and the Grow More Food Campaign and at the end of the first half the industry recorded a 3 % growth rate. Weather conditions are expected to be more favourable after July, which would augur well for production, and there is no revision to the projection of 2 % growth.

The MOA (26) had reported that production in the livestock (Table 8) industry was targeted to remain stable through 2011. However, for the first half of the year overall production levels actually increased by 2.7 %, with increased production evident in areas of poultry meat, table eggs, mutton and beef while pork production declined. As a result there is now a higher expectation of the eventual annual output and the original growth projection has been revised upwards to 0.6 %.

The fisheries industry was targeted to grow just marginally by 0.4 % over the production performance of 2010. However, during the first half of the year, the industry recorded a downward trend (Table 8), with negative growth of 2.2 % (A1). A contributory factor in the reduced production was higher prices for fuel, a critical input in the industry. The industry is now projected to contract by 4.7% in the full year (27).

In the forestry sector, MOF (27) reports a first half of 2011 negative growth of 30.3% in the production of logs, lumber and round-wood all contracted. Notwithstanding the resumed production of plywood manufacturing operations, sustained international demand for several of Guyana's traditional species now boosted by the penetration of Guyana's lesser used species into the international market (Table 8), and attendant improvement in international market prices, the sector is now projected to contract by 19.9% by year-end compared to an earlier projected contraction of 1.4%.

Table 8. Guyana's Agricultural, Fisheries and Forestry Production. 2011

PRODUCT	PRODUCTION
Sugar	2,020,862 t
Rice	390,000 t
Other Cereals	25,000 t
Meat	24,000 t
Fish	44,000 t

Wood Fuel	854,000 m ³
Industrial Round Wood	525,000 m ³

SOURCE: FAO (2).

3.5.2 Markets

In 2007, the value of Guyana's imports of food was just over US\$143 million, representing 13.9% of total imports; the main food imports were milk, wheat, non-alcoholic beverages, and bread and baked goods. A number of agricultural products are subject to import licensing (33).

The Guyana Office for Investment (12), reports that recent changes in the global trading environment, such as the reduction of guaranteed prices for rice and sugar in the E.U., have placed pressure on Guyana's traditional agricultural exports. Nevertheless, investments in productivity and efforts to shift exports towards non-E.U. markets can help ensure that rice and sugar remain mainstays of Guyana's economy for some time into the future.

Agricultural exports according to the WTO (33), particularly exports of food are of great importance to Guyana's economy. Guyana is a net food exporter. In 2007, the value of Guyana's food exports was just over US\$338 million, representing 43.1% of total exports. Guyana's main export is raw sugar (19.2% of total exports in 2007). Ninety per cent of sugar produced in Guyana is exported, mainly to the U.K. Guyana's sugar exports have benefited from guaranteed access to the EC market, but this is being phased out, and from a smaller U.S. preferential quota. Guyana's second largest export is rice (9.4% of total exports in 2007), and over 70% of production is exported.

The most significant development is the change in the EC's import regime for sugar. Since the 1970s Guyana has benefited from preferential access to the EC market under the terms of the Sugar Protocol: the EC guaranteed to buy 159,410 tonnes of sugar (white sugar equivalent) from Guyana at a fixed price. From 1993/94 to 2006 this fixed price was €523.7 per tonne for raw sugar. In 2006, the European Commission started to implement phased reductions on quota import prices. To a lesser extent, preferential access has also been granted, since 1995, under the EC Special Preferential Sugar Agreement (SPS), and under the Complementary Quantity in 2006 after the SPS arrangement was terminated (33).

Both the Sugar Protocol and Agreement are being phased out in the context of the CARIFORUM-EC Economic Partnership Agreements (EPAs) concluded in December 2007. As set out in the EPA, the Sugar Protocol terminated on 30 September 2009. All sugar exports from CARIFORUM states will enter the EC duty free and quota free

by 2012, subject to a special safeguard clause. As an interim step, for the marketing year 2008-2009, the EC committed to open an additional tariff rate quota at zero duty for 60,000 tonnes of sugar originating in the CARIFORUM states, half of which is reserved for the Dominican Republic (33).

Guyana enjoys comparative advantage in the export of other crops and livestock products, fruits and vegetables, and aquaculture. Those advantages arise from the availability of land, water, labour costs, organic production basis, and its preferential position as a potential exporter to the CARICOM. Guyana has a favourable advantageous position in terms of animal and plant health status since it is free from the fruit fly and the foot-and-mouth disease (14, 24, and 30).

Sugar accounted for nearly 12 % of GDP and over 20 % of Guyana's exports in 2005. Most sugar exports were destined for the E.U. under a preferential trade agreement. The CARICOM region, which is protected by the common external tariff (CET), is also an important market for Guyanese sugar. While cuts in the E.U.'s guaranteed prices will have an impact on the industry, a modernization program with significant investment by GUYSUCO will help maintain the profitability of the sector by raising annual production. Although the sector is mature, opportunities still exist in processing the raw product into crystallized sugar, as well as the brown sugar market, which GUYSUCO reports to be under-served throughout the CARICOM region. Opportunities also exist for the by-products of sugar-based products, such as ethanol (12).

Like sugar, Guyana exports rice primarily to Europe and the CARICOM region. According to the Guyana Rice Development Board, this trade pattern is starting to shift following the E.U.'s reduction in the guaranteed price for Guyanese rice. However, Guyana could further expand its market share in the Caribbean; currently it holds 50 % of the Jamaican rice market. Furthermore, Brazil is emerging as an important export destination, as the Brazil-Guyana Partial Scope Agreement established a quota for duty-free importation of Guyanese rice. While sufficient Brazilian demand exists, this quota has yet to be met due to a lack of supply (12).

According to the Guyana Rice Development Board, the average export price for Guyanese rice ranged from G\$42,226.8 per tonne in 2003 to G\$56,379.2 in 2007, which is similar to the world market price for rice. Guyana benefits from preferential access for its rice exports: in 2007, 50% of rice was exported to CARICOM countries (particularly Jamaica and Trinidad and Tobago) and 34% to the EC under preferential conditions. Efforts have been made to bolster rice production: including through water works and improved research and development services; seed paddy plants have also been constructed to enhance output. In addition, the authorities note that there has been investment in improving irrigation systems, which had

fallen into disrepair, through funding by external donors. The Rice Factories Act has been amended to help farmers who are experiencing problems to receive payments for their crop on time from millers. A levy of US\$4 per tonne for whole grain rice and US\$2 per tonne for rice by-products is applied to both exports and domestic sales. This finances the activities of the Guyana Rice Development Board (33).

GOI (12) informs that although Guyana's mature sugar and rice industries will continue to play an important role in Guyana's economy, the non-traditional agriculture sector has a high growth potential. With investments in production, facilities, quality assurance and processing, non-traditional agriculture could become an engine of export growth. Guyana's comparative advantages in diversified agriculture include: abundance of diverse agricultural environments, which include: 1) highly fertile soils in the coastal areas—currently used extensively for rice and sugarcane production—with large parcels of flat irrigated land that can be used for fresh fruits and vegetables, dairy and beef production (Guyana has been certified as foot-and-mouth free); and 2) intermediate savannahs with untapped opportunities to produce beef, milk, mutton, citrus, corn, cashew nuts, legumes, peanuts, soybeans, dairy products, and orchard crops. The savannahs have large tracts of brown soils that are well drained and responsive to fertilization, creating an ideal environment for the application of high technology and the establishment of medium/large scale agriculture operations.

WTO (33) informs of developments in the non-traditional sector, Guyana has signed protocols for the export of various fruits and vegetables from certified farms to St. Lucia, Barbados, and Antigua and Barbuda. The authorities note that there has been an annual growth of around 10-12% in exports of non-traditional products, with emphasis being placed on targeting production to meet demand. The products being focused on as having greatest export potential are: pineapples, peppers, pumpkins, plantains, cassava, spices, and beef. Attention is also being given to improving management of the sector. Altogether nearly 80 non-traditional commodities are exported from Guyana. Over the review period, there has been a notable increase in exports of dried coconut, copra, palm hearts, mangoes, pumpkins, and watermelons.

The long tradition that Guyana has had in processing seafood for exports, has provided a readily available infrastructure that can easily be transferred to aquaculture. As a means to diversify its agro-exports, Guyana has already been showing progress in non-traditional agro-based exports. In 2002, Guyana exported 78 different non-traditional agricultural products. Non-traditional exports have been growing at an annual rate of 6%, since 1993; however, they still have a low base (14, 9). In spite of the said comparative and competitive advantages, Guyana has

not been capable so far in building a non-traditional export sector since it faces several constraints along the supply chain as well as a poor business climate (20).

According to the WTO (33) fishing and related processing activities make a significant contribution to foreign earnings, accounting for 7.3% of Guyana's merchandise exports. An increased focus is being placed on developing a viable aquaculture industry in Guyana. In 2008, fishing contributed 6.5% to GDP. While Guyana's fish catch has fluctuated slightly over the review period, the catch of small shrimp declined in 2007. Guyana's main exports are frozen crustaceans and fresh or chilled fish, which together accounted for 7.3% of Guyana's total exports, at a value of some US\$57.3 million. Most fish products are exported to the United States (some 55% in 2007). In 2004, one company received formal certification from the EC to export fish products to Europe.

Guyana is a net food exporter (Table 9); however, there is a need to import some foodstuff (Table 10). According to information recovered from FAOSTAT (3), in 2009 Guyana's major exports were sugar, rice and molasses, contributing with G\$ 225,627,000 of export income. In the same year, Guyana's main food imports were 3,175 t of whole powder milk, 49,956 t of wheat, 24,279 t of food wastes and 19,653 t of soybean cakes. Other important food imports are 8,325 t of prepared foods and 9.823 t of fresh potatoes.

Table 9. Main Food Exports. 2009

COMMODITY	AMOUNT (t)	VALUE \$1000
Raw sugar	194,729	101,826
Milled rice	99,194	53,905
Husked rice	68,201	50,315
Broken rice	40,417	14,686
Molasses	25,512	4,895
Copra oil	1,358	2,226
Copra	1,398	776
Pumpkins	1,176	557
Dried fruits	973	469
Watermelon	1,006	526

Source FAOSTAT.

Table 10. Main Food Imports. 2009

COMMODITY	AMOUNT (t)	VALUE \$1000
Powder whole milk	3,175	18,048
Wheat	49,956	14,269
Food wastes	24,279	10,418
Prepared foods	8,325	10,413
Soybean cakes	19,653	8,110

Palm oil	2,883	4,353
Cheese	855	3,385
Wheat flour	3,678	2,756
Potatoes	9,823	2,022
Margarine	600	1,736

Source FAOSTAT.

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The average applied MFN tariff rate for the manufacturing sector, defined in accordance with the International Standard Industrial Classification, was 11.3%, just under the average protection afforded to the economy as a whole. Under the Customs and Excise Act, manufacturing inputs that undergo a substantial transformation or change in their essential character are exempt from import tariffs. Guyana offers tariff concessions on inputs used in a number of approved manufacturing activities. To assist the development of the manufacturing sector, the Government offers various specific tax incentives for the production and export of manufactured goods, in addition to horizontal incentives offered (33).

The Industry Department of the Ministry for Tourism, Industry and Commerce is responsible for promoting industrial development and the management of industrial estates with the overall aim of encouraging investment in manufacturing. The Guyana Manufacturing and Services Association, a private organization, provides policy advocacy, marketing, and technical assistance to manufacturing firms (33).

Exports of unprocessed forest products account for around 4.9% of total merchandise exports. A policy adopted in 2009 seeks to encourage the export of high quality processed wood, by imposing an increased rate of commission on the export of certain species of log. The contribution of forestry to Guyana's GDP in 2008 was 1.7%; in 2007, just over 27,000 people were employed in the sector. Three quarters of Guyana is covered by forest, and there are over 1,000 tree

varieties. Guyana has a total state-owned forest area of 13.6 million hectares, of which 5.6 million hectares has been allocated for commercial purposes. State-owned forest is divided up into several classes, according to use potential. Around 4.8 million hectares of forest land are not state-owned; these are owned mainly by Amerindian communities (33).

Tariff barriers to imports of forestry products are low: the applied rate is 5% on all tariff lines. Guyana's average bound rate is 86.7%, with rates ranging from 50% to 100%. In practice, imports are virtually non-existent (33).

3.5.3 Production Systems

3.5.3.1 Crops

Sugar

Sugarcane was introduced into Guyana early in 1630, and the scale of its planting expanded rapidly from the second half of the seventeenth century onward. In succeeding eras the sugar industry in Guyana played the most important role in the economy and even today, on the eve of the twenty-first century, it continues to be the largest single employer in the country. Sugar in Guyana is fundamentally an export industry, but since 1996 its export earnings have shrunk gradually, since it cannot expand by selling more on the world market without incurring losses (5).

In 1976, the government of Guyana nationalised and merged the sugar estates operated by Booker Sugar Estates Limited and Jessels Holdings, to form the Guyana Sugar Corporation, known as GUYSUCO. The main business of GUYSUCO is the cultivation of sugar cane and the production of sugar. Sugar accounts for approximately 20% of the GDP and 40% of agricultural production. Since then, GUYSUCO has committed to produce fine raw sugars (17).

The NDS (5) identified constraints the sugar industry has to address, many are still valid, and they may be summarized as follows:

- Shortage of skilled technical and managerial personnel,
- High labour turn out,
- ineffective capital expenditure programme,
- High costs of production,
- High costs of transport,
- Inefficient production and milling systems,
- Inefficient and deficient irrigation and drainage systems, and
- Fluctuating world prices.

Another key constraint for the sector is monetary resources for investment. Government initiatives have increased financial resources, but these may be insufficient in light of the obsolescence of the existing mills and the need to increase irrigation and drainage facilities. A way must be found to procure the required investments for the sector to be more competitive in the face of the present world market conditions (5).

Sugar recovery formulae are based on various quality analyses, from sub-samples of delivered cane, usually derived from direct estimates of pol % cane, juice purity and fibre % cane. NDS data (5) show Guyana's average sugar recovery per tonne of sugar cane, is 8.4 % based on an average cane yield of 70.6/ha. The average yield per hectare is considered low, when compared to other countries, as is the average sugar recovered per tonne of cane, indicating that production and milling efficiency need to be improved.

Other NDS data (5) indicate that there is a relationship between the cane growers' share of proceeds, on the one hand, and the high ratio of labour costs to the value of the cane, on the other hand. The latter in turn tends to be linked to the general level of the country's economic development. Viewing the matter in this light, Guyana's current level of development does not justify the high growers' share (70 %) of proceeds. This, high labour costs and the low sugar recovery rate, negatively affect the competitiveness of Guyana's sugar industry in an open world market.

The NDS (5) addressed the issue of factory rehabilitation pursuing valid technical objectives such as reduce processing costs; increase sugar output; and phasing-out obsolete mills. In addition the NDS established a new set of policies aimed at improving the sector's competitiveness, in addition to the technical measures in field and factory outlined above. The policies arose out of a conviction that sugar in Guyana has a long-term future, and out the need to safeguard its prospects, given its importance to our economy. The NDS recommended undertaking financial and structural measures to achieve higher competitive levels of the sugar industry. The proposed measures address foreign exchange rate, reduction of secondary and direct production costs, the revision of the National Cane Farming Act, wage levels, closure of inefficient plants, more active participation of the private sector in financing and management of the industry and adjustment of the farmers' share, and the participation of cane workers in production by transferring land titles to cane workers. While GUYSUCO and other large plants have achieved the technical objectives and applied the suggested financial and structural measures, there are many smaller plants that have not and may not be able to cope with the impact of more recent events.

The most significant recent development is the major change to the EC's import regime for sugar. Since the 1970s Guyana had benefited from preferential access to the EC market under the terms of the Sugar Protocol. In 2006, the European Commission started to implement phased reductions on quota import prices. To a lesser extent, preferential access has also been granted, since 1995, under the EC Special Preferential Sugar Agreement (SPS), and under the Complementary Quantity in 2006 after the SPS arrangement was terminated (33). In the face of the changes in the European Union import regime, Guyana has taken steps to restructure the sugar industry to become more competitive by lowering costs, increasing production, and adding value to core as well as diversified products. Its main initiative is the Skeldon Modernisation Project launched in 2005. This has involved replacing the sugar factory at Skeldon with a new facility with the capacity to manufacture more sugar at a lower cost. The project should also be able to provide 8 MW of power to the national grid annually. Construction of the new factory has been completed, and functional tests are being undertaken with commissioning expected before mid-year 2009. It should have the capacity to process 1.2 million tonnes of cane annually into more than 160,000 tonnes of sugar.

A WTO (33) report indicates that the Government has set a target for sugar production of 400,000 tonnes by 2013. In order to boost sugar production, mechanical harvesting has been introduced, a modern packaging facility was established, and investment in infrastructure, such as the Skeldon complex, has encouraged cane farming by independent producers. The GUYSUCO has also, diversified into higher value-added branded (Demerara Gold, Demerara Brown); and has been successful in penetrating the Caribbean market.

The new factory at Skeldon uses diffusion technology for milling requires less power, this technology is particularly suited to co-generation. The Skeldon Project in Berbice, has contributed to increase the competitiveness of the sugar industry, by reducing production and operational costs, increasing milling efficiency and quality, and attracting carbon credits. The Project also involves expanded cane cultivations, the establishment of a refinery and facilitates the co-generation of electricity for the national grid (17).

GUYSUCO's commitment to its Strategic Plan in enhancing its provision of raw bulk sugar with value added production is the first phase towards reorganizing the East Demerara estates into a modern industrial complex. In two years, the Project Gold evolved from a mere process design, to the supplying and installation of sugar processing equipment when in May 2011, the new ENMORE Packaging Plant was commissioned (17).

Table 11, details sugarcane and sugar production from 2006 to 2010. Area harvested has remained relatively stable, while yield/ha decreased from 70.2 t/ha to 57.3 t/ha, resulting in a decrease in cane and sugar production.

Table 11. Cane and Sugar Production in Guyana

YEAR	AREA HARVESTED (Ha)	PRODUCTION		
		CANE tonnes	CANE YIELD t/ha	SUGAR tonnes
2006	42,400	2,975,000	70.2	701,650
2007	39,700	3,099,200	78.1	780,654
2008	49,100	2,766,500	56.3	563,441
2009	48,300	2,766,000	57.3	572,670
2010	48,300	2,766,000	57.3	572,671

Source: FAOSTAT.

The cane yields are expected to increase based on the continuing timely availability of higher yielding varieties, soil ameliorants, fertilisers, agrochemicals, and water, and increased availability of machinery will continue to be sufficient to allow a sustained annual replant programme of 20 % of the cane area reaped for the mill, with the concomitant maintenance of the industry infrastructure, particularly canals, drains, and roads. The results of the pest and disease control programmes have removed any such significant limitation to production at the majority of estates; therefore reducing these threats to yield increase. In land development, significant increases in cane area are feasible. Such extensions will not be possible unless there is a secure supply of water and appropriate drainage in the new agricultural frontier (5).

The widespread introduction of sucrose enhancement or "chemical ripening" technology to all GUYSUCO estates, incorporated cane quality parameters; as a effect of ripener application on pol % cane and first expressed juice purity sugar yield is increased. However, this technology is not appropriate for all cane growers as the need to carefully control aerial application of a ripener and to tightly manage the subsequent reaping period, as well as other logistical considerations, it seems unlikely that the smaller cane farmers can utilise cane ripeners (5).

Rice

The Rice Industry of Guyana has been in existence for over a century, starting with the production of a wetland variety called "Carolina Gold Rice". Rice has been an exportable product since 1903, when the first five tonnes were exported (10). In Guyana, approximately 162,000 ha are irrigated, of which close to 81,000 ha are planted with rice, 52,000 ha with sugar cane, and 28,000 ha are allocated to other

crops and livestock. In 2008, the rice sector accounted for 12.5 % of the agricultural GDP and 14.9 % of national export earnings⁴. Rice is the major source of employment in rural areas and approximately 8,000 farmers are directly involved in rice cultivation. Paddy production takes place along the coastal plain in Guyana (5).

A World Bank (21) report shows that historically, region 5 (Mahaica/Abary and West Berbice), region 6 (Black Bush Polder and Frontlands) and region 2 (Essequibo) have been the most important paddy production regions, contributing with the largest production volume in both the cropping seasons. Most agricultural activities take place in the coastal plain, which lies below sea level, at high tide agricultural production has to rely on effective drainage systems. Currently, drainage throughout most of Guyana is poor and river flow sluggish because the average gradient of the main rivers is only one meter every 5 km.

Paddy is cultivated in Guyana during two crop seasons, one in spring and the second in autumn. The spring crop is generally planted in November or December and harvested from March to April. The autumn crop is usually sowed in June or July and harvested between September and October. Paddy cropping calendars are synchronized with the rainy seasons. Rice cultivation is largely mechanized and large wheeled tractors are used for land preparation, which includes ploughing, harrowing and muddling. The crop is directly seeded using pre-germinated seeds sown onto flooded fields. The seeds are, however, usually sown manually. Harvesting is done by combine-harvesters and the paddy transported in bags or in bulk to the mills (21).

The GRDB provides a series of services to farmers such as: capacity building, hybrid seed production and distribution, quality assurance, monitoring and auditing, extension services and pest control for exports. It maintains a very strong control on rice quality throughout the supply chain. It has agents at each buying station to ensure that quality requirements are maintained and it operates its own rice lab for monitoring the quality of all export orders. It also provides a mandatory pest control service for all export rice. GRDB appears to have been successful in ensuring that Guyanese rice maintains its strong reputation for quality with international buyers, as evidenced by almost no occurrences of rejected orders based on quality issues (21). In addition to GRDB, the Rice Producers Association (RPA) also plays a role in providing extension services to farmers.

According to the WB (21), the rice supply chain is marked by direct interaction between farmers and miller-exporters. It is primarily geared for export markets and approximately 70 % of the total rice production is exported. The primary industry participants are farmers, millers (processors) and exporters with support services

provided by banks / micro finance institutions, input suppliers (seeds, fertilizers and chemicals) and shipping companies. While the GRDB (10) reports that Guyanese rice industry incorporates many stakeholders, farmers, millers, exporters, consumers, input suppliers, transport providers and the public sector. It has been estimated that there are approximately 10,000 farm families that depend on rice for their livelihood. Guyana also has 105 privately owned rice mills. In addition to farm families, workers in the rice mills, exporters, input suppliers, etc., also depend either directly or indirectly on the rice industry. Thus approximately 100,000 persons (14% of the entire population) rely on this vital industry (15).

However, the WB (21) report identified a diminishing trend in the total number of farmers and processors (millers) operating in the Guyanese rice supply chain has fallen consistently over time. While there were 12,600 rice farmers in 1978, currently only 7,993 farmers are engaged in rice cultivation. The number of millers has declined from 96 in 2000 to 69 in 2009. Today, exclusive rice exporters no longer exist in Guyana. Vertical integration is frequent in the rice supply chain, with the larger millers starting to export directly and the exporters entering the milling business. In addition to the consolidation of the milling industry, millers have been attempting to increase their value-added by raising the proportion of parboiled and white rice as a share of total exports. Rice exports were more concentrated in 2006 with 5 exporters accounting for more than 90% of export market share and just two exporters accounting for more than 70% of total export market share. In 2009, 8 exporters exported just under 90% of rice from Guyana and share of the largest two exporters fell to 45%.

Guyana's rice production and exports, has increased dramatically since the 1990's (15). This has resulted from the expansion of the area cultivated. However, as detailed in Table 12; while area harvested and total production have increased, yield per ha have decreased. Rice production rose from 468,700 ha in 2006 to 507,400 in 2010; while yield/ha decreased by nearly 50 %. The main reasons for this yield drop are reported to be related to flooding and erratic rainfall patterns during harvesting. At the present time Guyana's rice industry is undertaking a participatory strategic planning process to chart a course for the next 10 years.

Table 12. Rice Production in Guyana.

YEAR	AREA HARVESTED ha	PRODUCTION (t)	YIELD Kg/ha
2006	102,100	468,700	4.6
2007	105,900	458,700	4.3
2008	119,800	507,000	4.2
2009	214,800	553,500	2.6

2010	205,000	507,400	2.5
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SOURCE: FAOSTAT

While the rice industry faces multiple market and regulatory risks, production risks are primarily responsible for causing variability in rice production and have a negative impact on the long term competitiveness of the industry. Sustained competitiveness will require effective management of production risks, leading to reduced volatility in production and export volumes (21). Excess water is one of the biggest risks that farmers confront on a regular basis. Floods in Guyana stem from three interrelated factors: excessive rainfall, inadequate drainage infrastructure, and sub-optimal water management. Weed, pest and disease, namely paddy bug and red rice, cause significant losses to farmers and have a negative impact on the quality of rice milled and exported. Every year, the rice supply chain loses a sizeable amount of volume and value due to this which could be averted by further investment in weed, pest and disease control.

Two other major constraints facing the rice sector, identified by the WB (21) are access to finance and high shipping costs. Total lending to the rice sector declined from G \$11.6 billion in 2000 to G\$3.4 billion in 2008. Frequent flooding, bankruptcy of millers, and default by big farmers were cited as the main reasons behind this decline. Lending by commercial banks to the rice farmers in Guyana fell from G\$5.7 billion in 2000 to G\$1.7 billion in 2008. Lending to the rice millers declined from G\$5.9 billion in 2000 to G\$1.7 billion in 2008.

Peanuts

Peanut production (table 14) plays an important role in some areas of the country. In the remote Rupununi region of Guyana, peanut farming dominates the local economy and farmers depend upon the crop as their main source of income (30). Production is done at the subsistence level by small-scale farmers for the local market.

Recent agricultural developments have enhanced production from 1,100 pounds per acre to over 2,500 in four years. As a result of increasing yields Guyanese farmers have not only benefited from local markets in Guyana but have increasingly seen the export of Guyanese peanuts in the Caribbean market (30). Rupununi farmers are part of an integrated school feeding programme that includes peanut butter processing and peanut butter sold to schools etc Rupununi farmers are part of an integrated school feeding programme that includes peanut butter processing and peanut butter sold to schools.

The data in Table 13 shows that while area harvested has remained fairly constant from 2006 to 2010, production and yield/ha have increased more than 500 t and 500/kg ha, respectively.

Table 13. Peanut Production in Guyana.

YEAR	AREA HARVESTED (ha)	PRODUCTION (t)	YIELD kg/ha
2006	1,763	1,751	9,932
2007	2,047	2,335	11,407
2008	2,123	2,553	12,025
2009	2,190	2,412	11,014
2010	1,900	2,300	12,105

SOURCE: FAOSTAT

In Guyana, peanut exports have been notably affected by food safety concerns (30). In the Rupununi region in particular, the local peanut crop needs to be tested for aflatoxins, a group of carcinogenic toxins that occur in the soil. Guyanese farmers are obliged to comply with the Guyanese Food and Drug Department (FDD) and cannot sell peanuts unless they are certified as free of all aflatoxins.

Other Crops

The NDS (5) identified a wide range of commodities is produced by the sub-sector for local consumption and export. Crops are classified under the broad headings of ground provisions, vegetables, citrus, fruits (other than citrus), seasonings, oil crops, grain legumes and grains. Livestock categories include dairy, poultry, beef, pork, sheep and goats. The major non-traditional crops are the following:

Cereals and legumes: Corn, black-eye peas, manica and other

Oilseeds: Peanut and coconut

Ground provisions: Cassava, sweet potatoes, eddoes, yam, tania/dasheen, plantains

Vegetables and greens: Tomatoes, cabbage, pumpkins, bora, ochra, boulangier, squash, cucumber and other vegetables

Spices and seasonings: Eschalot, hot pepper, ginger, tumeric and other spices

Fruits: Banana, pineapple, carambola, watermelon, mangoes, genip, cherry, and awara

Citrus: Lime, grapefruit, orange, other citrus

Other crops: Coffee, cocoa and cotton

Non-traditional crops are geographically distributed across the 10 regions. Except for coconut palms, almost all of the fruits, vegetables, legumes and ground provisions are grown by a large number of small farmers across Guyana. The production of coconut palms is concentrated along the coastal regions by large farmers. Activities are concentrated along the coastal belt and the Riverain areas, as well as in some enclaves in the intermediate savannahs and in the townships which border neighbouring countries. Small farmers produce all fruit and most vegetables grown in Guyana, 80 % of the grain crops, 60 % of the coconuts, and 40 % of the palm oil. Governmental enterprises account for the rest of the production of coconuts and palm oil (5). MOA has identified four crops as objective for the Agricultural Diversification Programme; these are peppers, pumpkins, plantains and pineapples.

3.5.3.2 Livestock Production

Guyana is self-sufficient in all animal products except milk and poultry (5). Milk and poultry production have, however, increased over the years. The area under livestock is approximately 25,000 ha of land. The production responses in the milk industry can be attributed to Government's intervention, and the removal of consumption taxes and duties on inputs to the poultry. Despite these initiatives livestock production in Guyana is below its potential capacity. The industry still requires a well-coordinated infusion of support services to sustain and increase production, and ultimately to capture export markets. Low level technology applications prevail in most of the subsector, and farmers (particularly pig and small ruminants' producers) are operating at subsistence levels constrained by factors such as limited financial resources, inefficient animal nutrition diets, low animal genetic capacity, ineffective animal health programmes and inefficient animal, pasture and forage management practises.

The Poultry Sector

The poultry industry remains one of the single most important industries in the livestock subsector in terms of employment, contribution to GDP and production. The poultry industry is dualistic in both its spatial location and structure of production. Large-scale broiler processors are typically organized on relatively extensive areas that are highly mechanized. There are an estimated 100 independent commercial broiler farms, varying in sizes from 95 m² – 1,600 m²; with

large farms accounting for 4,700 m². A small number of processors contract farmers to supply live birds and these 'contract grower' farms account for about 38,100 m² of farm space. In addition it is estimated that there are some 3,000 small 'back yard' farmers with average sizes of 25 m² (28).

The Swine Sector

There are approximately 2500 pig farmers, located mainly in Regions 2,3,4,5 and 6. The number of pigs reared in Guyana is approximately 200,000 head. Production is generally a 'back yard' type system, pursued mainly by small farmers as part of an integrated farming system. A few farmers practice large scale commercial swine production with over 100 head of pigs. A wide range of local products and by-products are used for feeding pigs, these include commercial feeds, rice bran, copra meal, wheat middling, molasses, fish meal, shrimp meal, kitchen waste and scraps (28).

Small Ruminant Sector

There are approximately 130,000 head of sheep and 79,000 head of goats. Guyana is one of the countries with the greatest number of sheep within the CARICOM region; however, it is perhaps the country with the lowest production parameters. The carcass dressing weight and other production parameters lag behind those of other Caribbean countries. The local sheep stock is predominantly the Barbados Black-belly and Creole. There is an increased demand for breeding animals; consequently, farmers have been importing other exotic breeds of sheep such as the Katahadin and the Dorper, and there is also a programme for the introduction of the Texel. The use of the Boer breed has seen tremendous increases in the goat parameters (28).

The Cattle Sector

Guyana is believed to have between 220,000 – 250,000 head of beef and dairy cattle. They are spread mainly in Regions 2, 3, 4, 5, 6, 9, and 10. The principal dairy producing Regions are 2, 3, 4, 5 and 6 while the main beef producing regions are Regions 3, 5, 6 9 and 10. A 2006 census revealed that the cattle populations of Regions 5 and 6 were 69,478 and 41, 148 heads, respectively (28).

New Vision for the Livestock Sector

The MOA has proposed to make the livestock industry internationally competitive through activities that include the establishment of a comprehensive animal production/health system; increasing the capacity of government institutions to

provide extensions services; developing an Agriculture Business Development Unit; providing support to the beef sector to strengthen the production for export; and establishing a credit facility for non-traditional exports (28).

This new vision is being implemented through the Agricultural Diversification Programme, supported by IDB, which serves the purpose of establishing services and institutions for a sustainable increase in the income from the export of non-traditional agricultural output in aquaculture, F&V, and livestock sub-sectors and enhancing the protection of consumers from illness and domestic production, from disease and contamination. The strategic actions of the ADP include improved on-farm management and marketing strategy; establishment of finishing lots; development of an animal genetic improvement strategy; improvement of the quality and safety of meat products by introducing Hazard Analysis and Critical Control Point (HACCP) and quality assurance protocols; establishment of modern abattoir and meat packaging and processing facilities; implementation of research and extension services; establishment or strengthening staff development activities; establishment of an effective information service; implementation of good agricultural and manufacturing practices; and improvement of the legislation of the agricultural health and food safety system (28).

The GLDA arose from the perceived need to establish semi-autonomous agencies within the Ministry of Agriculture as a consequence of the ADP. The GLDA provides administration and regulation of trade, commerce and export of livestock or livestock products and all other related matters. Within the ADP, stakeholders are anticipated to increase their earnings considerably as a result of an increase in export earnings. The Vision of the GLDA is to promote greater efficiency in the livestock product industry and to provide enhanced services in livestock husbandry, livestock health and research and to make provision for effective Administration and regulation of trade, commerce and export of livestock or livestock products and for matters related and incidental (11).

3.5.3.3 Fisheries and Aquaculture

Fish products took on increasing importance during the 1980s as potential earners of foreign exchange. By the end of the decade, shrimp had become the third leading earner of foreign exchange after sugar and bauxite. Fisheries production in Guyana totalled about 36,000 tons in 1989, down from 45,000 tons in the mid-1980s. The most valuable portion of the catch was the 3,800 tons of shrimp (18). Guyana has the ideal conditions for a dynamic seafood and fisheries industry. These include a 459 km Atlantic coastal zone and an extensive network of rivers. It was the third most important export after sugar and gold, amounting to nearly US\$62 million in 2005. In 2009 fish product exports totalled 56,125 t and generated G\$ (22). The U.S. is the primary market for most seafood exports. In 2004, however, Guyana was certified to export seafood to the lucrative EU market, creating a range of new market opportunities. While the seafood industry primarily consists of marine species caught in Guyana's exclusive economic zone (EEZ), aquaculture has recently attracted significant investment growth.

The Government (22) informs that fisheries sector is of importance to the country's economy. Its importance is evident in four areas:

Fish is the major source of animal protein in Guyana. It is estimated that per capita annual consumption of fish rose from 9 to 27 kg between 1980 and 1988, jumped dramatically to 45 kg in 1991, and reached 59.8 kg in 1998.

Fisheries are the third largest contributor to the country's GDP.

Guyana's export earnings from fisheries, which were G\$ 162,881,562.

The fishing industry employs some 4,800 people in harvesting and 5,800 in processing. The fisheries sector of Guyana comprises three primary components: marine fisheries, inland fisheries, and aquaculture.

1 Marine Fisheries

Guyana has a coastline of 432 km. and a continental shelf area of 48,665 km². The average width of the continental shelf is 112.6 km. The area of the Exclusive Economic Zone (EEZ) is 138,240 km². Industrial fishery dominates the export market, which is concentrated on shrimp, whereas the artisanal and inland fisheries, almost in their entirety, are oriented toward the domestic market. Most of Guyana's fishing occurs in the relatively shallow waters of the continental shelf. The marine resources exploited within the EEZ are mainly the Demersal fishery resources and, to a much more limited extent, the pelagic fish resources which are to be found both over the continental shelf and toward the continental slope (5).

Some of the species, particularly prawns and shark, are showing clear signs that they are being exploited at an unsustainable rate; while some deep slope and pelagic species are underexploited in spite of their greater potential. From a commercial viewpoint, the most important stocks may be the cross-boundary species. Harvesting these stocks and ensuring that they are exploited in a sustainable manner will require joint initiatives with Venezuela, Suriname, French Guiana and Brazil (5).

However, small scale or artisanal fishery is an important source of food, in both rural and urban areas and is increasingly significant as a source of employment, income and foreign exchange. This type of fishery experienced rapid growth, both in numbers of participants and volume of landings, up to 1992, but since then production has levelled off. This is probably due to a reduction in the volume of fish resources (5).

Inland Fisheries

Fisheries in inland waters are an important source of food for Guyanese; however, their importance relative to other production systems has been diminishing over the past decades. Contributing to this diminished importance have been the changes in aquatic environments caused by human activities such as damming, navigation, wetland reclamation for agriculture and urbanization, water extraction and transfer, and waste disposal. The rising demand world-wide for water and for the services it can provide is also placing pressure on all uses of this resource with a corresponding need to rationalize and intensify individual sectors while ensuring their harmonious integration (22).

In Guyana the multi-purpose nature of use patterns in inland waters creates a distinct climate for the development and management of fisheries which, in the past century, has become one of the least significant in terms of financial yield. Management of water resources should be conducted jointly with other users and based on regulations governing their activities (22).

Freshwater fishing is conducted in rivers, creeks, lakes, reservoirs, canals, and in savannah areas where the seasonal increase in rainfall gives rise to large expanses of seasonally flooded lands. This type of fishing is influenced by the down period in agriculture and the unavailability of other economic activities. For example, in the sugar estate areas the intensity of fishing varies adversely with the harvesting of sugar cane and rice. Freshwater fishing is undertaken with small, flat-bottomed, dory type vessels and cast nets, seine or hand-lines. The limited data available indicate that most inland fishing is carried out by Amerindians, although non-Amerindians fish in inland waters near the coast and in the vicinity of logging and mining communities situated in the interior of the country (5).

The MOA (22) currently promotes four strategies for the use of inland waters for fisheries: 1) practise food fisheries on wild stocks depending on natural reproduction and fertility; 2) food fisheries in smaller water bodies to raise productivity of selected species above natural levels; 3) recreational fisheries to supplant commercial food fisheries; and 4) intense exploitation of juvenile or small adult forms of species for stocking into other water bodies and aquaculture ponds or for the ornamental fish trade.

3 Aquaculture

Activities in aquaculture first started in Guyana in the 1950s; however, the development of the industry has been slow. It has been retarded by the lack of investment capital; inadequate technical skills; the utilisation of inappropriate technologies, equipment and inputs; and the almost total absence of research and training. Moreover, there has been very little foreign investment in the industry since investment prospects generally have been better elsewhere in the region (5).

Two forms of aquaculture are basically practised in the country: traditional extensive brackish water culture, and freshwater pond culture. Brackish water farms operate as extensive polyculture systems utilising the existing channels and dams from the sea defence structures which control the exchange of water at high tide. Farmers often construct their own dikes and sluices to regulate the flow and exchange of water within individual ponds. In most cases, the trapped fish and shrimp grow without any additional inputs. Brackish water culture occurs mainly in the swamps along the Atlantic Coast of the Corentyne. The average size of a farm is eleven hectares. Tilapia and, to a limited extent, catfish, are the main species cultured in Guyana, in freshwater farms (5).

While Guyana's marine resources have been an important component of its economy for some time, commercial aquaculture, especially in regard to tilapia and shrimp farming, is an emerging industry receiving the attention of both the Government and private investors. Although the industry is in its young stages, a number of factors are driving opportunities within the aquaculture sector. Located on the West Bank of the Demerara, the New Line Aqua Farm is pioneering Guyana's farming of Tilapia for export. The company has a state-of-the-art facility with 100 acres of fresh water ponds with advanced technology and is moving towards the completion of an integrated production system with a hatchery, feed mill, fish pond and processing plant for export to the U.S. and Caribbean. Once the processing plant is completed, the company expects to be able to fill five 20-foot freezer containers of frozen tilapia for export each week (14).

In general, the world's fisheries are experiencing a decline in ocean catches (a result of over fishing). At the same time there is a growing demand for fish products, resulting in higher prices. Buyers are in constant search of new sources of quality fish that are available year round. Aquaculture can meet that demand. There is a growing demand for farmed fish, such as tilapia, not only in the U.S., where imports have grown dramatically in recent years, but also the E.U., which certified Guyana as an aquaculture supplier in 2004. Key markets include fresh filets going to the retail sector and frozen fillets going to the food service sector (14).

Constraints

The key to the development of any type of fishery is long-term sustainability. If exploitation rates are not controlled, the continuous contribution of fisheries to GDP, exports, employment, and nutrition, will be significantly jeopardised. Conservation and management measures to control harvesting levels and protect stocks are therefore the highest priorities in the development of a strategy for the sustainable growth of Guyana's fisheries sector.

General constraints identified by the Government (5) are: some major commercial stocks are being exploited near or above maximum sustainable yields; few arrangements are in place to manage or protect trans-boundary stocks; the fisheries management system is inadequate; there are resource constraints in public institutions; the fishing gear currently in use is inadequate and leads to excessive amounts of by-catch and the destruction of stocks of juvenile fish; the mangrove habitat is being destroyed, thus reducing breeding grounds for shrimp and other species; the post-harvest infrastructure is underdeveloped throughout the country; industrial fishermen utilise obsolete technologies; very little market information is available in the artisanal sector; there are very few management skills in the artisanal sector; and destruction of the inland waterways by environmentally destructive practices.

The NDS (5) identified two specific issues for inland fisheries 1) the need to protect the waterways from environmentally destructive practices associated with the expansion of mining and forestry operations, and 2) the development of potential inland fisheries and aquaculture. An emerging constraint is pollution from mining activities and the use of chemicals and pesticides threaten these resources.

Identified aquaculture constraints include limited access to land; high capital costs in the industry; ineffective policy to promote investment in the sector; and the limited infrastructure to facilitate research, development and extension activities by the public institutions (5).

Constraints for processing and marketing identified (5) include: the limited cold storage and processing capabilities in the artisanal sector make it difficult for finfish exporters to expand their markets. A lack of information and expertise related to international fish markets also inhibits the development of cottage industry exports. Over-capacity in the industrial sector and under-capacity in the cottage industry processors are important issues to be addressed. There is also a need for improvements in market intelligence and quality control.

The Fisheries Department of the MOA is responsible for the management, regulation, promotion and sustainable development of Guyana's marine and inland fishery resources. The unit conducts research, and extension activities, and produces comprehensive statistics. Stakeholder organizations include the Guyana Association of Trawler Owners and Seafood Processors (GATOSP) as well as thirteen fishermen's cooperative societies (14).

3.5.3.4 Forestry

Guyana has vast forest resources that cover more than three-quarters of its landmass and contain over 1,000 different tree varieties. Currently, 120 species are being logged in various forms, with between 12 and 15 of these logged on a commercial scale through a system of concessions. The most sought after species include Greenheart (*Colubrina arborescens* or *Chlorocardium rodiei*), Mora (*Mora excelsa* and *Mora gonggrijpii*), Baromalli (*Catostemma altsonii*), Purpleheart (*Peltogyne* spp), Crabwood (*Carapa guianensis*), Kabakalli (*Goupia glabra*), and Wamara (*Bocoa prouacensis*) (9).

In 2005, Guyana exported over US\$52 million in forest products, ranging from raw and sawn timber, to plywood, moulding and furniture products. Plywood accounted for about 20 % of all forestry exports, with higher-value products, such as furniture, representing a small, yet rapidly growing share (5 %). Guyanese wood experts estimate that Guyana is capable of filling most of CARICOM's demand of 300 million board feet of tropical wood. Total 2009 production of round-wood and charcoal were 458000.00m³ and 22,755 t respectively (33).

While Guyana is traditionally known for its export of timber in raw or semi-processed forms, the Government and segments of the forest product industry have placed an emphasis on promoting value-added forest product production for export to the Caribbean, U.S. and Europe. In this regard, there are a number of comparative advantages, similar to those found in other light manufacturing industries, such as affordable and trainable labour, as well as attractive investment incentives (13). In Table 14, exports for 2008 and 2009 are detailed. A comparison of both years shows a declining trend in exports, particularly in total round-wood, plywood and sawn-wood.

Table 14. Wood Product Exports in m³. Guyana 2008 - 2009.

ITEM	2008	2009
Ind Rwd Wir (NC) Tropica	103,000.00	67,000.00
Particle Board	38.00	38.00
Plywood	16,000.00	11,000.00

Sawnwood (C)	4,560.00	4,560.00
Sawnwood (NC)	48,000.00	42,000.00
Veneer Sheets	491.00	491.00
Wood Fuel Trd	44.00	44.00
Wood Residues	40.00	40.00
Industrial Roundwood + (Total)	103,000.00	67,000.00
Ind Rwd Wir (NC) Tropica	18,080.00	11,784.00
Other Paper+Paperboard	107.00	107.00
Particle Board	7.00	7.00
Plywood	6,582.00	4,115.00
Printing+Writing Paper	183.00	183.00
Sawnwood (C)	1,146.00	1,146.00
Sawnwood (NC)	26,013.00	24,509.00
Veneer Sheets	248.00	248.00
Wood Charcoal	151.00	204.00
Wood Fuel Trd	2.00	2.00
Wood Residues	2.00	2.00
Forest Products + (Total)	52,521.00	42,307.00
Industrial Roundwood + (Total)	18,080.00	11,784.00

SOURCE: FAOSTAT

The Government (13) data shows that approximately 52 % of state forests have been allocated to timber harvesting concessions. The industry uses world-class harvesting techniques to ensure the sustainability of Guyana's forest resources. Three types of concessions are awarded, based on area size and duration:

1. Timber Sales Agreement – granted up to twenty-five years for areas in excess of 24,000 hectares.
2. Wood-cutting Lease – granted for up to ten years for 8,000 - 24,000 hectares.
3. State Forest Permission – granted for a two-year period on no more than 8,000 hectares.

A number of lucrative opportunities exist for investors interested in working with Guyana's wood industry. These include furniture (e.g. hardwood and wicker), plywood and veneers, moulding and doors, parquet, floor tiles, and other related products. There are also a number of opportunities to expand the development and marketing of lesser-known species where utilization is well below capacity, or where species are yet to be utilized commercially (13).

There are a number of governmental and private organizations involved in the forest products sector. The Guyana Forestry Commission (GFC) is the government agency responsible for the administration and management of the 13.6 million hectares of land classified as State Forest. Forest Products Association (FPA) represents private forest producers and has substantial practical knowledge of timber production and forest uses. The FPA collaborates with the GFC in selected training and research initiatives. This includes the Forest Training Centre Incorporated (FTCI), which was established in collaboration with the Tropical Forest Foundation (U.S.) and DFID (UK) to implement a Reduced Impact Logging program focusing on hands-on demonstration and training in an actual timber harvesting operation. The FPA is also a timber development partner in the Iwokrama International Centre for Rain Forest Conservation and Development (13).

The Government of Guyana continuously updates policies and laws relating to the conservation, management, protection and sustainable development of forest resources. This initiative began with the drafting of the National Development Strategy in 1996. The Strategy provides guidance for the development of the forest sector by identifying national development objectives and constraints. The first National Forest Policy was prepared and finalised after two years of broad consultation with the industry and other sector interest groups. In 2001, the Guyana Forestry Commission responded to the requirements of the National

Development Strategy with a programme for the formulation and implementation of policies, strategies and action plans for the forest sector (9).

The GFC (9) coordinated the revision of the National Forest Policy Statement and the National Forest Plan in 2010, through a series of consultations involving wide stakeholder involvement. This revised Forest Plan therefore embodies ideals for enhanced development and wider opportunities for the management of Guyana's forest estate. Programme areas of the Plan have expanded to address new dispensations such as the Low Carbon Development Strategy (LCDS), increased value-added production, additional guidelines for sustainable forest management (including non-timber forest products), improvements in marketing strategies, meeting training and human resource capacity needs, ensuring community development are satisfied, and forest resources equitably shared; all of which are enshrined in the National Forest Policy Statement.

Hence the National Forest Plan provides the framework through which the National Forest Policy is implemented and therefore requires periodic update to complement changes in the policies governing the forest estate. The Plan comprises several programme areas which are executed through a number of activities, many of which are long-term and continuous, whilst some are more short term (9).

The overall objective of the National Forest Policy is: the conservation, protection, management and utilisation of the nation's forest resources, while ensuring that the productive capacity of the forests for both goods and services is maintained or enhanced. To support the implementation of the forest policy, the GFC reviewed existing forestry legislation and prepared a new draft Forests Act. The purpose of the new Act is to reform the law relating to the management of forest resources, to provide for sustainable management and to consolidate provisions of predecessor legislation (9).

Guyana with other rainforest countries, face many development challenges. Guyana's Government has recognised as top priority, the development the economy to provide resources to fund these and many other social and economic needs. In an effort to reconcile this with the world's need for forests to be kept intact, the Guyanese Government seeks to find a way to make national development and avoiding deforestation complementary, not competing, objectives. With this objective, the Office of the President carried out an analysis of needs to align the economic interests of the country with those of the global community. Results suggest that baseline assumptions should be driven by analysis that assumes rational behaviour to maximize economic opportunities for forest dwellers (an 'economically rational' rate of deforestation). The Guyanese Government also recognised that to be sustainable in the long term, any measures to address deforestation must have the support of those who live in, and depend on, the forest. Since the baseline methodology is tied to actual economic pressure on the forest, it makes REDD more acceptable to Guyanese forest stakeholders (6).

3.5.3.5 Agro-processing

The sugar, rice and non-alcoholic beverage industries have dominated the processing industry in Guyana. Agro-industrial activities in Guyana fall into three categories, micro-processing, small-medium scale processing and large scale processing or manufacturing. Each category has played an important role in the development of agro-industrial capacity of Guyana. Despite the large differences in scale and resource endowments (18).

Today the agro-processing sector is mainly made up of small and medium sized enterprises in the processing of traditional agricultural products and fresh fruits and vegetables for domestic use and export including margarine, beer, jams and jellies, coconut oil, condiments and snacks, fruit juices, and various pastes. However, there are a number of competitive constraints that currently hinder the expansion of the agro- processing sector, including limited quantity and quality products, poor product consistency, expensive and unreliable transportation, poor quality packaging, fluctuating local prices and lack of cold storage. Moreover, in order to be successful, the processed foods industry requires an adequate supply of quality agricultural raw materials, which is where improvements in the fruits and vegetables supply chains will be imperative for future success of the sector (8).

A variety of agricultural commodities is produced in the country, many of which have viable linkages to agro-industry (18). The most commonly processed fruits have been pineapple, guava and cherry jams and jellies, other preserves and pulp for the production of concentrates. Carambola is used to produce candied fruits for local consumption and export. Some varieties of fruits are used in the production of flavours in the production of carbonated soft drinks. Due to diminishing profits, the beverage industry has diversified to food processing. Common products include cereals, snacks, biscuits and tomato ketchup. The food processing segment is characterised by the use of a larger volume of raw materials. The non-alcoholic beverage industry has developed largely through trademarks and the licensing of international trade brands. Other viable commodities for processing identified by the ADP include coconut copra, seafood, crushed hot pepper, pumpkins and plantain. The processing of wood products has not matched the developments of the timber and logging industries.

The marine subsector includes plants for the processing, deep freezing, packaging and storage of prawns, seabob, and some finfish. The bulk of the prawns caught are beheaded and/or shelled, blast frozen, packaged and exported to markets in North America. The forest products subsector is highly segmented and embraces logging, sawmilling, plywood manufacture, charcoal production, furniture

manufacture, and prefabrication. Sawmilling and plywood operations are vertically integrated. Some of the production centres for livestock products (beef, mutton, pork, poultry, eggs and milk), are spatially mismatched in relation to the demand points. There is significant importation of milk products from Europe. Distilling and/or manufacturing of soft drinks (aerated beverages), beer, malt, and rum, is becoming a very significant contributor to the manufacturing sector (5).

The Government (8) has concluded that developing the sector is crucial in the drive to add value to the expanding production of raw non-traditional agricultural products; this will provide greater job creating opportunities while diversifying the economy. The sector has many linkages with other sectors in the value chain, such as agricultural inputs, transportation, packaging, marketing and distribution. Hence, the indirect impacts of development of the sector are significant and if additional value can be added through further processing then actual economic impact will be substantially higher.

Moving forward to effectively compete against imported products and into export markets will require Guyana to meet the price, product safety and quality and delivery requirements demanded by the market (8). It also implies developing human resources at the managerial, technical and labourer levels.

3.6 Institutional Framework

The institutional framework for the agriculture sector is made up of various agencies ranging from the Ministry of Agriculture and the National Agricultural Extension and Research Institute (NAREI) to producer organisations and Neighbourhood Democratic Councils (NDCs). The NDS (5) made recommendations to deal with the constraints these agencies face, such as limited financial and human resources; weak linkages between national agencies; a weak policy review capacity; and a lack of decentralisation.

The public agencies responsible for agricultural export diversification, have limited capabilities to cope with their respective missions. The main institution that supports agriculture is the Ministry of Agriculture (MOA). Within the MOA, the Pesticides and Toxic Chemical Control Board (PTCCB) exercises control over quality, sale and usage of pesticides and toxic chemicals, while the National Agricultural Research Institute (NAREI), the Guyana Rice Development Board (GRDB) and the Guyana Livestock Development Agency are responsible for increasing the productivity of crops, rice and livestock, respectively (20). The Guyana Forestry Commission is responsible for the formulation and implementation of policies, strategies and action plans for the forest sector (9).

The GLDA and GRDB are administrative areas within the MOA, whereas PTCCB, NAREI and NGMC are semi-autonomous agencies under the MOA. The Ministry of Health oversees the Food and Drug Department (FDD) and the Veterinary and Public Health Unit (VPHU). The FDD's main remit is to protect public health, and helps encourage compliance with the requirements of international trade. The VPHU promotes human health, minimizing the risk of transmissible diseases from animals to humans and by food, derived from animals; and certifies processed meat for export (20). The Fisheries Department of the MOA is responsible for the management, regulation, promotion and sustainable development of Guyana's marine and inland fishery resources. The unit conducts research, and extension activities, and produces comprehensive statistics (13). The Guyana Lands and Surveys Commission (GLSC) is responsible for managing state-owned lands, and specifically for making such lands available under a leasehold or freehold arrangement. The Guyana Office for Investment (GO-Invest) is responsible for investment facilitation and export promotion (20).

Farmers that grow crops other than rice and sugar have not established product specific organizations, although they receive services from organizations such as the Rice Producer Association (RPA) since it is common to farm mixed crops. Cattle Farmers Associations are organized along the Drainage and Irrigation Areas. The Guyana Agri-Business Association (GABA) was established to promote agribusiness development. GABA membership is open to interested private parties along the supply chain. The National Aquaculture Association of Guyana (NAAG) includes members from various parts of the industry, including entrepreneurs/farmers, processors, feed producers, members of government (research and investment), and non-governmental organizations. The Guyana Marketing Corporation (GMC) provides market facilitation services to the private sector for the export of non-traditional agricultural produce. The Forest Products Association (FPA) represents private forest producers and has substantial practical knowledge of timber production and forest uses (20). Stakeholder organizations in fisheries include the Guyana Association of Trawler Owners and Seafood Processors (GATOSP) as well as thirteen fishermen's cooperative societies (13). The Guyana Agro-Processors Association (GAPA) was established in 2009 by a group of agro-processors. The main objective of the association is to ensure the establishment of common standards and practices among agro-processors within the non-traditional agricultural sector. The association's efforts are geared towards providing low cost financing and developing new and innovative products and packaging facilities.

3.7 Agricultural Education

According to Davidson (1), admission of students to tertiary level institutions such as, the University of Guyana (UG), the Guyana School of Agriculture (GSA) and

vocational schools has its genesis in quality education offered at the primary school level. As Davidson points out, a formal agricultural education system provides people with the necessary competence (knowledge, skills, attitudes and values) in the science and art of agriculture. The instructional models applied by such institutions to achieve teaching-learning objectives may consist of lessons, lectures, laboratories, demonstrations, practices, term papers, tours or field trips, quizzes and exams.

Davison (1) identifies the following categories of formal agricultural education institutions in Guyana: primary, secondary, vocational and tertiary. Davison recognises within the tertiary category, intermediate and university level institutions. He also recognises the contribution to agricultural education by secondary level institutions, among these; it is worth mentioning St. Stanislaus College, founded in 1864; President's College and many Community Schools. These secondary schools have pursued many interesting learning objectives and topics such as a balanced theory-practice model, technical efficiency, entrepreneurship and innovation.

In 1972, the Ministry of Agriculture assessed the need for a practical programme of agricultural education in Region 1. Thus, in March 1973, a vocational level institution, the Burnham Agricultural Institute began operations in Araraka. Soon thereafter, the Port Morant Training Centre was founded near Berbice, which now is operated by GuySuCo and has contributed considerably to agricultural education. Other vocational centres worth mentioning include the Agricultural Corps, the Guyana Prison Service, the Youth Entrepreneurial Skills Training Programme, the Kuru Kuru Cooperative College and the Guyana National Service; all having contributed to the formation in agricultural fields (1).

At the tertiary level, several institutions have significantly contributed to agricultural education, among these, Davidson (1) identified the Hinterland Development Programme, which initiated with a two year programme; the Cyril Potter College of Education, which implemented a prevocational and an Agricultural Science Programme; the Guyana School of Agriculture, which began operations in 1963 as an intermediate level, mainly committed to forming middle level personnel for agricultural extension and research; and finally the Faculty of Agriculture and Forestry, which was founded in 1977 solely as the Faculty of Agriculture; subsequently, in 1987 a diploma in forestry was introduced and in 1996 a BSc, in Forestry was established.

The President (10) stated that Government's aim is to implement effective programmes to improve access to, and quality of education, with a strong emphasis on equipping the labour force with the skills needed in the domestic economy of

tomorrow. This vision has been articulated and guided by a series of plans in the education sector, the current one being the National Education Strategic Plan 2008-2013, towards which Government expended a sum of \$21.8 billion in 2010. Furthermore, work continued during 2011 on the design of a US\$10 million project to strengthen the School of Earth and Environmental Sciences at the University of Guyana as a permanent academic and research institutional presence, geared towards mainstreaming the environment by addressing the national priorities flowing from the implementation of the

Accompanying this initiative will be the establishment of a world class Centre of Excellence for Biodiversity Studies and Research at the University. Additionally, the University of Guyana has been allocated \$769 million towards the operations and maintenance of the Turkeyen and Tain campuses, whilst a further \$450 million has been provided for student loans (10).

3.7.1 Structure

An analysis of agricultural education in Guyana by IICA (18) indicates that Guyana's agricultural education strategy is based on two programmes, the Technical and Vocational Education and Training (TVET) and the Agricultural Education Programme (AEP). IICA observed that the TVET system comprises three major components: 1) the prevocational education (PREVOC) component which is conducted at the nursery, primary and secondary schools as well as at the Practical Instruction Centres (PICs); 2) TVET conducted at the technical Institutes; and 3) TVET conducted at UG in the faculties of Agriculture and Forestry and of Natural Sciences and Technology (19).

3.7.2 Higher Education Institutions

The higher learning institutions are recognised in Guyana, these are Government Technical Institute (GTI), the Guyana School of Agriculture (GSA) and the Faculty of Agriculture and Forestry of the University of Guyana (FAF/UG). Of these, the latter two are the most recognised (19).

3.8.2.1 The Guyana School of Agriculture

The Guyana School for Agriculture (16) was established to satisfy a need for a national agricultural training institution in Guyana. It began operations in September 1963. In 1964, the GSA became a corporation and a Board was appointed by the Minister for Agriculture to formulate policies which would direct operations.

In 2004, the GSA began a Diploma programme in Animal Health and Veterinary Public Health. In 2007 a Certificate in Fisheries was introduced and in 2008, began to offer the Diploma in Agriculture and in Forestry at the Essequibo Campus (16).

From the beginning, the Guyana School of Agriculture (16) developed a plan to form professionals to solve problems faced by the Guyanese society, in particular, those of the agricultural and forestry sectors. To fulfil its mission, the Faculty has developed and modified the curricula of both Schools, in search of pertinence and relevance of the competences of the professionals formed. As a result of these actions, today the Faculty offers the following degrees:

Academic programmes

At present, GSA (16) offers the following academic programmes:

Programme	Years to Graduation
Diploma in Agriculture	2
Diploma in Animal Health & Veterinary Public Health	2
Certificate in Agriculture	2
Certificate in Forestry	1
Certificate in Fisheries studies	1

3.7.2.2 UG Faculty of Agriculture and Forestry of the University of Guyana

The University of Guyana (27) was established by an Act of Parliament in April 1963. Its aim was 'to provide a place of education, learning and research of a standard required and expected of a University of the highest standard, and to secure the advancement of knowledge and the diffusion and extension of arts, sciences and learning throughout Guyana. The University opened for classes in October 1963.

The University's main campus is sited at Turkeyen, approximately 8 km east of the centre of Georgetown. In order to extend services beyond the main campus, the Department of Extra Mural Studies was established in 1976 and upgraded in 1996 to the Institute of Distance and Continuing Education (IDCE). In 2000, a second campus was created at Tain, Berbice to fulfil similar expansion of access (27). The University has now been in operation for 46 years and up to 2008 had produced 26,771 graduates, 25,770 from Turkeyen and 1,001 from Tain.

The Faculty of Agriculture and Forestry was established in 1977 offering a Bachelor of Science (B.Sc) in Agriculture. A Diploma in Forestry was introduced in 1987 and the B.Sc. in Forestry in 1996. The Forestry Unit was initially under the Office of the

Vice-Chancellor and was placed under the Faculty of Agriculture in November 1989. The curricula for both the Diploma and the B.Sc. in Forestry were extensively revised in June 2001 (27).

Today, the organic structure of the Faculty has two Schools, the School of Agriculture and the School of Forestry. The Department of Agriculture is aimed at producing highly trained professionals through teaching, research and service to cater for the development of agriculture to meet national and regional needs. The Department of Forestry is committed to produce a cadre of professionals through excellence in teaching, research and service to meet changing demands in forestry and related sectors locally and regionally (27).

The School of Earth and Environmental Sciences was approved on 22nd February, 2005 in recognition of the shared expertise, analytical techniques and complementarities that existed between the Department of Geography, Faculty of Arts and the Environmental Studies Unit, Faculty of Natural Sciences. It is the expectation that the merger will allow students specializing in the field sciences to benefit from a broader foundation and the rationalization of overlapping programmes. The School has an Advisory Board whose members are drawn from Governmental, non-governmental, regional, and international organisations and from the academic community. The function of the Advisory Board is to enhance the capacity of the School for taking measures to achieve its objectives (27).

One of the university's most recent and significant accomplishment was the formation of the Berbice campus (27). This relatively new campus, which became operational in 2000, was established with the intention of making university education more accessible to Berbicians, who previously endured the inconvenience of travelling to the Turkeyen Campus to pursue university studies.

In its early stages, the University of Guyana – Berbice Campus (UGBC) offered two-year undergraduate Certificate programme in Education (various options) and Diploma programmes in Accountancy, English, History, Marketing, Public Management and Social Work, Degree programmes were subsequently offered: the Degree in Agriculture and the Associate Degree in General Science (various options) were offered in the 2001 – 2002 academic year, and Degree in Public Management and Education as well as the Post-Graduate Diploma in Education were offered in the 2002-2003 academic year. The first graduation ceremony was held in November 2002 with a batch of ninety-three students (27).

In terms of facilities and educational resources, the Berbice campus has shown significant developments. The Computer Laboratory and the UGBC library, constructed in 2000, have both undergone structural expansion to accommodate

more resources (computers and books) for the growing number of students. The teaching block, erected in April 2002 and comprising of fourteen classrooms was also designed to facilitate the increasing student population. Another noteworthy addition to the Berbice campus was the Johns Science Centre, opened in 2000 and located at the Jonesville Site (27).

Academic programmes

FAF (16) at present offers the following academic programmes:

Programme	Year to Graduation
Bachelor of Science Degree in Agriculture	4
Degree in Agriculture (Animal Science Option)	4
Degree in Agriculture (Crop Science Option)	4
Degree in Agriculture (General Option)	4
Degree in Forestry	4
Diploma in Forestry	2

3.8 Challenges to Agriculture, Agro-industry and Agricultural Education

3.8.1 Challenges to Agriculture

The literature reviewed allows stating:

Guyana, as many other developing countries, faces three major challenges:

1. To modernise and increase the sustainability of agriculture and the agricultural sector.
2. To become competitive in internal and external markets, with quality products and just prices.
3. To link growers and their products to existing markets.

Hence, the agricultural sector requires a restructuring to face these challenges and responsibilities. To achieve the above, a strategic alliance among public, private and academic, institutions is compulsory.

These challenges require an entrepreneurial transformation, which promotes a renewed and amplified vision of agriculture based on crop and/or animal production systems, productivity, competitiveness and on value supply chains.

This restructuring should focus on improving management skills and capacities, developing agribusiness and agro industrial capacity and increasing the capacity to

develop knowledge and to be innovative in farmers and agricultural professionals. To benefit from these developments:

- ✓ Farmers must grow what consumers demand, and perform as producers, transformers and marketers;
- ✓ Farmers must change their subsistence attitude to one of entrepreneurs;
- ✓ Small-scale farmers must organize in associations, clusters, federations or cooperatives;
- ✓ Farmers' technological competence and in natural resource management must be increased;
- ✓ Farmers should be able to readily access information and communication technology;
- ✓ Government must effectively address farmers' needs, developing rural infrastructure and providing on time services, such as insurance, credit, education and training, and generation and transfer of appropriate technology.

Restructuring Strategies

Increase:

- ✓ agricultural infrastructure, services, access to resources, information and markets, entrepreneurial capacity; the pertinence and relevance of the production technology inventory; modernise legislation and policies; and
- ✓ strengthen the national research and extension service, grower associations, and public institutions.

To achieve and lead this restructuring, it is necessary to develop and/or strengthen the professional resource base. Hence, this process must be oriented to:

- ✓ Develop and implement, strategic alliances, and
- ✓ Increase the number of active researchers and extension agents, but above all, the number of agribusiness men and women in the agricultural sector.

3.8.2 Challenges to Agro-industry

The growth of agro-industry has been hindered by many constraints, financial, infrastructure, high energetic costs, lack of staff at all levels, lack of appropriate technology, lack of equipment and spares, high costs for extra-regional exports, and until recently, the lack of appropriate legislation for the assurance of food safety and quality (18).

In addition, the agro-industrial sector has to contend with a number of specific challenges, which include:

- ✓ the absence of a tradition to grow no-traditional crop commodities, inadequate financing for fixed and operating capital,
- ✓ limited access to, processing, packaging and labelling technology,
- ✓ irregular availability of raw materials,
- ✓ stringent requirements by public institutions,
- ✓ low institutional normative and inspection capacity,
- ✓ lack of research initiatives, and
- ✓ lack of a skilled technicians and professionals.

3.8.3 Challenges to Agricultural Education

Higher education institution, particularly those directly related to the agricultural sector, must cater to the needs of the rural population. To address this challenge, these institutions must:

- ✓ Establish strong working relations, between the academic population (teachers, managers and students) and the agricultural public and private sector.
- ✓ Identify educational and training needs of rural populations.
- ✓ Identify competences demanded from professionals by the private and public sector.
- ✓ Continuously update and improve the curricula, to ensure the formation of professionals with pertinent and relevant competence, to lead the reconversion of the agricultural sector.
- ✓ Update and improve their research and extension strategy (providing teacher and student opportunities) and capacity, to become a proactive (leading) participant in the national agricultural research and extension system.

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CHAPTER III INTERNAL DIAGNOSTIC STUDIES

1 INTRODUCTION

The Guyana School for Agriculture (GSA) was established to satisfy a need for a national agricultural training institution in Guyana. It began operations in September 1963. In 1964, the GSA became a corporation and a Board of Governors was appointed by the Minister for Agriculture to formulate policies which would direct operations. The objectives of the GSA were as follows:

1. To offer theoretical and practical training in agriculture.
2. To develop, manage and operate farms and undertaking of an agricultural nature.

From these objectives, evolved the following statement of mission:

“to promote and support agricultural development through education and training of young men and women interested in an agricultural career”

In 2004, the GSA began a Diploma programme in Animal Health and Veterinary Public Health, in 2007 a Certificate in Fisheries was introduced and in 2008, began to offer the Diploma in Agriculture and in Forestry at the Essequibo Campus.

From the beginning, the Guyana School of Agriculture (GSA) developed a plan to form professionals to solve problems faced by the Guyanese society, in particular, those of the agricultural and forestry sectors.

The University of Guyana was established by an Act of Parliament in April 1963. Its aim was `to provide a place of education, learning and research of a standard required and expected of a University of the highest standard, and to secure the advancement of knowledge and the diffusion and extension of arts, sciences and learning throughout Guyana. The University opened for classes in October 1963.

The University's main campus is sited at Turkeyen, approximately 8km east of the centre of Georgetown. In order to extend services beyond the main campus, the Department of Extra Mural Studies was established in 1976 and upgraded in 1996 to the Institute of Distance and Continuing Education (IDCE). In 2000, a second campus was created at Tain, Berbice to fulfil similar expansion of access. The University has now been in operation for 46 years and up to 2008 had formed 26,771 graduates, 25,770 from Turkeyen and 1,001 from Tain.

The Faculty of Agriculture was established in 1977 offering a Bachelor of Science (B.Sc.) in Agriculture. A Diploma in Forestry was introduced in 1987 and the B.Sc. in Forestry in 1996. The Forestry Unit was initially under the Office of the Vice-Chancellor and was placed under the Faculty of Agriculture in November 1989. At present, the Department of Agriculture offers four degree options and the Forestry Department offers two options.

The Guyana School of Agriculture (GSA) and the Faculty of Agriculture and Forestry at the University of Guyana (FAF); decided to strengthen their capacity to form competent professional demanded by the agricultural sector and Guyanese society. The Inter-American Institute for Cooperation on Agriculture (IICA) is supporting this initiative by providing technical assistance for a curriculum review and the strengthening the Guyana School of Agriculture and the Faculty of Agriculture and Forestry. This document presents the findings of the internal situational analysis and the opinions of participants in the external consultations (focal groups and individual interviews).

2 METHODOLOGIES

The first objective of the initiative, proposes to analyse and describe the present global, regional and national agricultural scenarios and that of the GSA and FAF, to characterize the present conditions of the educational institutions and describe the working environment in which their graduates will perform. The second specific objective of the initiative, proposes to identify the demand, the competences (knowledge, aptitudes, skills, attitudes and values) and graduate profiles pertinent and relevant to the needs of the Agricultural Sector.

The strategy for the internal situational analysis proposes two diagnostic tools, the first is *in situ* observations and the second a **SWOT** analysis by Lecturers and Officials of the institutions. The strategy focuses on six academic factors, curriculum, students, academic staff, graduates, academic administration and teaching resources.

The strategy for the external consultations proposes two consultation tools to collect the information required, the first is a "focal group discussion". Five such groups were organized: 1) private and public sector, 2) lecturers, 3) GSA Students, 4) FAF Students and 5) graduates. This methodology entails the organization of discussion groups to learn of subjects that fall outside the group's relation, but which are of common interest for all participants. As the title suggests, the study is not designed to quantify the occupational or professional demand, it is rather designed to: a) establish a frame of reference for the opinions and results, b) characterize the working scenario of future graduates, and c) gather the opinions of

participants, in relation to new work scenarios, the required professional profile, the level of performance of graduates and of the demand and opportunities for future graduates. The second tool is direct interviews to sector stakeholders that because of their daily agendas, could not participate in the focal group discussions.

The focal group sessions and the interviews discussed four topics, trends and course in agricultural, forestry and rural development in Guyana; functions performed by professionals and tasks at medium and long term; performances of graduates as agents of change; and the present and future demand for professionals.

A multidisciplinary staff team, supported by the Consultants, was established and to design the Improvement Plans for GSA and FAF. The team implemented the following activities to achieve the objective:

1. Developed a strategy to design the Plans and project profiles;
2. Analysed and validation of the information gathered through the qualitative study of the occupational and professional demand and the internal diagnostic study; selected the factors to improve; and drafted the project profiles for the Plans.

For the design of the project profiles that make up the individual Plans, the Team was sub-divided into two Teams, one for GSA and one for FAF. Each team selected the factors to improve.

3 THE DIAGNOSTIC STUDIES

3.1 Guyana School of Agriculture

3.1.1 Curricula

The Guyana School of Agriculture (GSA) offers six programmes (Table 1), three at the diploma and three at the certificate level. The diploma level programmes are considered as "sub-professionals" and target graduates from secondary schools and trained teachers. While the certificate level programmes target graduates from primary schools and farmers. The academic year begins in September and ends in June; it is delivered in three terms of twelve weeks each, September-December, January-March and April-June.

Over the years the Certificate has evolved into a Programme with similar emphasis as the Diploma; most classes are delivered together. While the entry requirements are lower, students attaining over 85% in the first term or the first year are

promoted to the Diploma programme. Mature students without the entry requirements for the Diploma programme usually enrol in the Certificate with the option to be promoted, once the requirements are met.

The curriculum of the Diploma in Agriculture comprises a total of 81 credit hours in two academic years. The structure of the curricula is as follows: approximately 68% and 25% of the credit hours correspond to basic sciences or professional related sciences and professionalization courses, respectively; the remaining 7%, are credit hours related to language, computer and personal development courses. The other Diploma options follow a similar pattern.

TABLE 1. Academic programmes offered at the Guyana School of Agriculture. 2011.

OPTION	TARGET POPULATION	CREDIT HOURS	DURATION
Diploma in Agriculture	Secondary school graduates	81	2 years
Diploma in Animal Health and Veterinary Public Health	Secondary school graduates	97	2 years
Diploma in Livestock Production and Mgt.	Secondary school graduates	NA	2 years
Certificate in Agriculture	Primary school graduates And framers	81	2 years
Certificate in Forestry	Primary school graduates And framers	46	1 year
Certificate in Fisheries	Primary school graduates and farmers	45	1 year

The curriculum of the Certificate in Forestry Programme comprises a total of 46 credit hours. The structure of the academic programme is as follows: 13% and 74% of the credit hours are basic sciences or professional related sciences and professionalization courses, respectively; the remaining 13% are language, computer skills and personal development courses, and are assigned 4.33%, each of the total credit hours. The other certificate programmes follow a similar pattern.

As there are no elective courses in the curricula and provides limited opportunities for personal development, it may be inferred that it is somewhat rigid. The main difference between Diploma and Certificate level programmes is the amount of science credit hours, being lower at the Certificate level. From the information provided, it was not possible to identify the total amount of credits related to practical activities. Noticeable absences from the curricula are natural resource management and entrepreneurial topics. Very few credit hours are allocated to fruit and vegetable production, soil management and conservation, irrigation and drainage, extension methods and personal development.

3.1.2 Students

The 2011 student population by academic programme and gender is detailed in Table 2. There are a total of 191 students enrolled and distributed as follows: 96 in the Diploma in Agriculture, 16 in the Diploma in Animal Health and Veterinary Public Health; 20 in the Certificate of Agriculture; 52 in the Certificate in Forestry; and 7 in the Certificate in Fisheries Studies. Approximately 39% of the student body are females. In the Animal Health Diploma programme, there are more female than male students, in the other options, the male gender predominates.

TABLE 2. Student Population by Programme and Gender. 2011

PROGRAMME	NO. OF YEARS TO GRADUATION	GENDER	
		FEMALE	MALE
Diploma in Agriculture	2	37	59
Diploma in Animal Health & Veterinary Public Health	2	10	6
Certificate in Agriculture	2	5	15
Certificate in Forestry	1	20	32
Certificate in Fisheries studies	1	3	4
Total		51	84

Students are provided with the following general services: library, reading and television room; visitor's waiting room; a common room; cafeteria; multi-purpose hall; free transportation to and from sport, social and cultural activities; dormitory and communal laundry; internet, telephone fax and photocopying facilities; sport facilities, and computer room.

Student welfare services include: health and safety, a warden and a matron provide basic first aid, for critical cases, off campus medical care is provided. Security, guards provide security throughout the campus. In-and-outdoor sport events are organized at the intra-student and inter student-faculty levels. Several cultural activities are organized throughout the year.

A student council is elected on an annual basis. The Council is led by a President, who together with his/her team organize student sport, cultural and social activities, as well as to represent students on campus.

3.1.3 Academic Staff

In 2011 the GSA had a total of 55 academic staff, of these, 13 and 42 worked full and part time, respectively. The academic staff members are supported by 6 and 15, technical and general staff, respectively. The distribution of full time academic

staff by academic programme and their qualifications and designations are listed in Table 3. The academic qualifications of the full time staff include 2 at master level and 8 at B.Sc. While the academic qualifications of part time lecturers range from a diploma to a PhD level, from the information gathered it is not possible to segregate part time staff by qualification.

TABLE 3. Distribution of Full time Academic Staff by Programmes; their Qualifications and Designations. 2011

STAFF MEMBER	QUALIFICATION	DESIGNATION
Brian Greenidge	B.Sc, Agriculture; Pot Grad. Dip.	Chief Executive Officer
Dexter Allen	DVM	Director of Administration; Officer-in-charge Livestock Farm
Grace Parris	M.Sc. Agriculture	Director of Academic Affairs; Manager of Agro- processing Unit
Natashia Ramdhani	ACCA Level 2	Academic Counsellor
Oscar Glasglow	B.Sc. Economics	Senior Lecturer/Farm Manager
Yolanda Hawker- Glen	M.Phil. Plant Science	Lecturer Forestry
Mechelle Lutchman	B.Sc. Agriculture	Lecturer
Shemika Pereira	B.Sc. Forestry	Lecturer Forestry
Yvette Best	B.Sc. Communications	Librarian/Lecturer
Mahadai Motielall	B.Sc. Agronomy	Lecturer/Research Assistant Agro-processing Unit
Ronda Pearson*	B.Sc. Forestry	Lecturer Forestry
Kevin Dookhit*	B.Sc. Computer Sci	Lecturer
Horatio Ramdass*	Diploma in Agriculture	Farm Manager/Administrator

*Based in Essequibo

Lecturer distribution by programme and employment level at the main campus is detailed in Table 4. A disproportion exists between full and part time staff; there are 13 full time versus 42 part time staff. The least amount of disproportion occurs in the Forestry Programme, which has an equal proportion between full and part time staff. The proportion part time: full time lecturers, ranges from 3:1 in Agriculture to 6:1 in Animal Health. This situation is a hindrance to the adequate delivery and quality of the programmes.

Equally concerning, is the scope of expertise of full time staff based at the main campus. Three staff members are general agriculturist, one is an agronomist, two

are forestry majors, one is a veterinarian, and one is a communicator. This scope of expertise may be considered as very narrow and a hindrance to the development of all the competences demanded from GSA graduates. There is a heavy dependency on part time lecturers to deliver the academic programmes, which diminishes tutoring and other opportunities for students. The most affected programme is Animal Health with only one full time lecturer, who also has administrative responsibilities; followed by the Fisheries and Forestry Programmes, with only 2 are full time lecturers in each of these programmes. Agriculture is the better staffed programme with 8 full time lecturers, however, it must be noticed, that many staff members also have other duties. Another concerning fact is that out of all the official designations, only one mentions research responsibilities and only at the assistant level.

TABLE 4. Number of Full and Part Time Lecturers per Academic Programme and Student : Teacher Ratio.. 2011.

ACADEMIC PROGRAMME	STUDENT:TOTAL/ FULL TIME TEACHER RATIO**	NUMBER OF LECTURERS	
		FULL TIME	PART TIME
Diploma in Animal Health & Public Veterinary Health	2.3:1* 16:1	1	6
Diploma and Certificate in Agriculture	4.6:1* 12:1	8	21
Certificate in Forestry	13:1 26;1	2	2
Certificate in Fisheries Studies	0.5:1* 3.5:1	2	13

*Rounded off to the nearest decimal.

**Considering a total of 55 teachers and 10 full time teachers.

The data in Table 4, also shows that over all student: full time teachers ratio is approximately 19:1; when the part time teachers are considered, the ratio drops to 3.5:1. It is worth mentioning, that when part time teachers are included, all programmes seem overstaffed; however, this figure has to be carefully considered, since the presence time of each part time teacher was not provided. But it may be concluded when considering only full time teachers the student: teacher ratio is acceptable.

3.1.4 Graduates

GSA is not only a school for Guyanese, graduates come from Caribbean countries such as Antigua, Bahamas, Barbados, Belize, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago,. The list also

includes graduates from Nigeria, North Korea, United States of America and Zimbabwe.

Since its foundation, GSA has formed 4,040 graduates in the different programmes offered. Graduates distribution by programmes is: 2,353 with a Diploma in Agriculture, 1,291 with a Certificate in Agriculture, 315 with a Certificate in Forestry, 52 with a Diploma in Animal Health, and 29 with a Certificate in Fisheries Studies.

The school keeps ties with graduates in the GSA Alumni Association, through newsletters and a yearbook. There is no evidence of the participation of the Alumni Association in the development of curricula.

3.1.5 Academic administration

3.1.5.1 Organization

GSA is a dependency of the Ministry of Agriculture, which appoints a Board of 12 Governors to formulate and implement School policy and provide guidance and governance to the School's administration, which rests on the Chief Executive Officer (CEO) who also seats on the Board. The CEO is assisted by a Director of Administration, a Director of Academic Affairs, and Farm Managers. The Administration is manned by five assistants.

3.1.5.2 Financing

GSA as public organization is self-accounting. The School receives a yearly budget subvention from the Government to meet current expenditures and on occasion a capital allocation. In addition, GSA generates income from the sale of farm and processed products, including excess animals; cafeteria services and student charges; tuition is charged only to foreign students. Other financial sources include endowment funds and fund-raising campaigns.

3.1.5.3 Academic affairs

All academic affairs are clearly defined in the Student Handbook, which includes staff, student admission and registration requirements, external relations, academic calendar, programmes, evaluation, graduation requirements, general regulations, student welfare, facilities and discipline. This Handbook is provided to all enrolled students and serves as a guide for all their activities on campus.

The curriculum lacks administrative flexibility as the students do not have a choice of lecturers or schedule to register for courses. None of the programmes offer elective courses to suit the students' vocation or personal development needs.

The presentation of the curricular grids is not standardized. The existing grid may lead to confusion, given the difficulty to differentiate between Diploma and Certificate levels.

3.1.5.4 Student affairs

Admission requirements are divided into Diploma and Certificate requirements. Both programmes have waivers for mature students. The student evaluation process includes examinations, practical assessment, continuous assessment and attendance. The grading system is divided in four levels, distinction (80=100%), higher credit (70-79%), lower credit (70-79% with one Resit exam), and pass (60-69% or above 70% with one Resit exam). The certification requirements are also well defined in the Handbook.

Student rules and regulations include: general aspects, attendance, dress code, dormitory, visiting rights, recess, off campus leave, pregnancy rules, cafeteria and end of year clearance.

3.1.5.5 Staffing, recruitment and development

The School has staffing guidelines; vacancies are advertised locally as well as overseas. A panel comprised by Board Members and the CEO, interview applicants for senior positions, and candidates are submitted to the Board for approval. Junior staff applicants are interviewed by the Personnel Officer, and recommendations are submitted to the CEO for approval.

GSA has a staff development programme; there is evidence that staff have participated in many training opportunities and professional events, however, most of these opportunities have been financed by external sources. The development programme has not been actualized and implemented because the financial resources have not been available.

3.1.5.6 External relations

The School has developed numerous external relations. Relevant partners at the national level are the University of Guyana, National Agricultural Research and Extension Institute, and the Guyana Forestry Commission. At the international

level, partners include, IICA, FAO, and universities in the Caribbean, United States, Canada and Cuba.

3.1.6 Teaching Resources

3.1.6.1 Finances

The annual budget for 2010-2011 is G\$292,026,000; it is a 6.23% increase when compared to the 2010 revised allocation. Revenue from the sales, up to November 2011, is up 0.4%, in relation to the revised 2010 sales. Government subsidies increased 12.2% in relation to 2010. Total expenditure for 2011 is estimated at G\$ 286,857,000, leaving a surplus of G\$ 5,169,000. Of the recurrent expenditure (G\$ 257,857,000), employment costs are estimated at 38.72%, while equipment and materials are 20.2% of recurrent expenses. All School officials interviewed agree that the budget is adequate.

3.1.6.2 Facilities

- **Classrooms**

The GSA infrastructure is considered adequate and in good condition for academic purposes. The 13 classrooms are spacious and can accommodate up to seven sessions at once. Furniture may need maintenance and or replacement. Considering Georgetown mean temperatures, air conditioning and better lighting in the classrooms would enhance the learning process.

- **Laboratories**

There are seven general laboratories at GSA, however, only five are in service; the other are closed for rehabilitation. The laboratories have a general functions as each covers more than one field of study; and all lack adequate biosafety measures (signs, safety protocols, appropriate fume hoods, etc.). Most of the equipment is in need of replacement; however, because of funding shortage, the School cannot implement a maintenance or replacement plan. Laboratory supervisors assist faculty staff in the development of student practice, they would benefit from further training. Specialization of the laboratories is desirable.

- **Library**

The library setting is appropriate, although furniture replacement air conditioning and better lighting, would improve the environment. It has an estimated stock of 500,000 volumes, although only 5% are less than five years old; the books are well

kept and organized; cataloguing is still manual. The working hours seem adequate to meet student needs. There are two computers with internet connection; online searches could benefit by establishing relations with other libraries, such as IICA's and FAO's; and from linkages with data bases such as AGRIS. Library staff is helpful and well informed, but library training is desirable. The library should pursue becoming a depository of FAO documents.

- **Computer Facilities**

The computer facilities are adequate; there are 25 computers available for student use. In fact, considering the amount of courses offered the facilities are underused. The equipment may need replacement soon, and there is no maintenance or replacement programme. The availability of printers in the facility would increase efficiency, as would the diversification of available software. The student computer ratio is 9.6:1.

- **Farm**

The size of the farm is more than adequate to provide for student practice. However, there is a need to improve classroom-practise timing and establish protocols for each practice. There is a need to improve plot management by keeping adequate records of land use and establishing appropriate crop rotation patterns. The farm and student practice would benefit from equipment maintenance and replacement plans.

Animal facilities (stables and pens) need rehabilitation to provide adequate comfort conditions for animals and a better learning experience for students and visiting farmers. The planting of shade trees along the sides of the stable and pens would also increase animal comfort. The health condition of animals needs improvement; many animals showed open wounds and lack of proper nutrition. Feed quality and animal genetics could improve; and record keeping needs to be established.

- **Processing Plant**

The agro-processing plant has an appropriate scale and is adequate for the level of teaching-learning demanded by the academic programmes. One area to improve is dry and cold storage for goods. There are some biosafety measures in place, such as signs and staff changing room; the latter should be extended to student use; safety protocols should be more visible; waste management protocols are needed; and more fire extinguisher alternatives are also needed.

Protocols for each practice should be up-dated and written; these should be discussed with students prior to each practice. The timing of practices should be in consonance with the delivery of the related theoretical knowledge to enhance the student's competence of relating knowledge to practice. The same holds true for laboratory practices. The agro-processing plant should adopt the guidelines of the *Codex Alimentarius* and apply a hazard analysis and critical control points (HACCP).

Both the farm and agro-processing plant would be more efficient in the learning-teaching process, if the implementation of joint School-Lecturers-Students productive projects was a practice, to enhance the formation of entrepreneurial competences and to generate income for those involved.

- **Student Dormitories**

The School provides dormitory accommodations for all enrolled students. The dormitories are divided into female and male quarters. The male quarter's house four persons per room; beds and desks are provided for students. The rooms in the female quarters accommodate two persons per room and are adequately furnished. Each dormitory provides communal laundry facilities for student use. Although students contribute to daily cleaning tasks, the School provides cleaning staff for male quarters. The student dormitory has adequate safety measures, rules and regulations and supervision. Perhaps more leisure facilities for sports and cultural events would improve the environment for students.

- **Cafeteria**

The dining room and kitchen facilities are clean. It accommodates and caters to the student body and staff. The food served has an adequate nutritional value and variety; and is culturally appropriate.

3.1.6.3 Equipment

Teaching equipment (projectors, screens, models, etc.) need to be replaced and increased to facilitate the teaching-learning process. Laboratory and farm equipment is old, out-dated, in poor working condition, and in some cases not in sufficient amounts. At the agro-processing plant, some of the equipment should be replaced, such as autoclaves, packing and abattoir. The School should make provision to draft and implement equipment maintenance and replacement plan. The School has some vehicles for transport, but it is deficient in number and needs replacement.

3.2 Faculty of Agriculture and Forestry

3.2.1 Curricula

The Faculty of Agriculture was established in 1977 offering a Bachelor of Science (B.Sc.) in Agriculture. A Diploma in Forestry was introduced in 1987 and the B.Sc. in Forestry in 1996. The Forestry Unit was initially under the Office of the Vice-Chancellor and was placed under the responsibility of the Faculty of Agriculture in November 1989. The Faculty of Agriculture and Forestry at the University of Guyana (FAF) offers degrees in Agriculture and Forestry. The Department of Agriculture offers four degree options and the Forestry Department offers two options (Table 5).

TABLE 5. Degrees Offered by FAF. 2011

DEPARTMENT	DEGREE	CREDIT HOURS	DURATION
AGRICULTURE	B.Sc. in General Agriculture,	137	4 years
	B.Sc. in Animal Science,	137	4 years
	B.Sc. in Crop Science, and	137	4 years
	B.Sc. in Soil Science	137	4 years
FORESTRY	B.Sc. in Forestry and	130/131	4 years
	Diploma in Forestry	66/67	2 years

Credit hour loads per semester and year for students in the Departments of Agriculture and Forestry are detailed in Tables 6 and 7, respectively. The load range in Agriculture Degrees ranges from 16 to 20 credit hours per semester. The actual load per semester leads to believe that there is room to add credit hours in all semesters, if needed. In Forestry (Table 7), the credit hour load per year ranges from 30 to 34 per year. Again, in most semesters, there is opportunity to increase the credit hour load.

TABLE 6. Credit Hours by Semester and Year for the B.Sc. in Agriculture. 2011

SEMESTER	CREDIT HOURS				
	YR 1	YR 2	YR 3	YR 4	TOTAL
1	16	16	16	16	64
2	19	20	16	18	73
TOTAL	35	36	32	34	137

TABLE 7. Credit Hours by Year for a B.Sc. in Forestry. 2011.

COURSE TYPE	CREDIT HOURS
-------------	--------------

	YR 1	YR 2	YR 3	YR 4	MP & PROJECT	TOTAL
Forestry	10	30	26	21/25	9	96/100
0Non-Forestry	26/27	0	4	4/0	0	34/38
Total	36/37	30	30	25	9	130/131

3.2.1.1 Degree in Agriculture

The first two years of the curriculum are the same for the four options in Agriculture. It is in the third year, that core courses differ and through a choice of electives students can acquire competences related to their option choice. The options' are:

B.Sc. Agriculture (General)

Students registered for this Programme must complete all CORE Courses, plus one elective each in Agronomy and Animal Science in the Third year, and at least two (2) electives each in Agronomy and Animal Science in the fourth year.

B.Sc. Agriculture (Crop Science Option)

Students registered for this Programme must complete all CORE Courses, plus two electives in the third year, one of which must be a CSC course, and five (5) electives in the fourth year, at least three of which must be CSC courses and at least one SSC course.

B.Sc. Agriculture (Soil Science Option)

Students registered for this Programme must complete all CORE Courses, plus two electives in the third year, one of which must be an SSC Course, and five (5) electives in the fourth year, at least three of which must be SSC courses and at least one a CSC course.

B.Sc. Agriculture (Animal Science Option)

Students registered for this Programme must complete all core courses, plus one elective in the third year which must be ASC courses and five (5) electives in the fourth year which must be ASC courses.

The options share a common curriculum structure with the General Agriculture curriculum which is:

- | | |
|---------------------------|-----------------|
| 1. Core courses | 78 credit hours |
| 2. Professional electives | 28 credit hours |
| 3. Basic sciences | 15 credit hours |
| 4. Computer | 4 credit hours |
| 5. Political science | 4 credit hours |

6. Language

8 credit hours

Crop Science and Animal Science option keep a similar structure. A breakdown of this structure shows that approximately 57% of the credit hours are related to core courses; 20% to professional electives; 11% relate to basic sciences; 6% relate to language skills; and 4% each to computer skills and political science. There are limited opportunities for personal development (sports, culture, ethics and etc.). Basic courses for crop and animal science such as biology, histology anatomy, are absent and these may be pre or co-requisites of courses offered such as microbiology, physiology, cyto-genetics and others. The chemistry component of the curricula is limited, only two general courses are offered, being absent organic chemistry, an important pre-requisite for biochemistry, endocrinology and other courses. Research competence is restricted as only one course in biometrics is delivered; no courses are offered on statistics, experimental designs or research methods. Also noticeable is the absence of courses related to irrigation and drainage, natural resource management and environmental conservation; and legislation and policy and entrepreneurial development. The presentation of the curricular grid does not allow assessing the time ratio of lecture to practice.

3.2.1.2 Degree in Forestry

The curricula for both the Diploma and the B.Sc. in Forestry were revised in June 2001. The present curriculum has two components, a two year Diploma Programme, which is the base for the B.Sc. Degree in Forestry. B.Sc students registering for this programme must possess a Diploma in Forestry from the University of Guyana or a similar qualification with a minimum GPA of 2.0.

The structure of the curriculum is as follows:

	DIPLOMA	B.Sc. DEGREE
1. Core courses	44	100
2. Professional electives	-	8
3. Basic sciences	11	11
4. Political science	4	4
5. Language	8	8
TOTAL	67	131

The present curricula share some of the weaknesses with those of Agriculture. It is somewhat more rigid as it only offers two electives. More basic science courses, statistics, research methods, and personal development courses would be desirable. The curricula has limited administrative flexibility as the students have no choice of lecturers or schedule to register for courses. None of the programmes offer elective courses to suit the students' vocation or personal development. The

curricular grids should be standardized and be done by programme. The existing grid may lead to confusion related to the different options.

3.2.2 Students

There are six student admission criteria followed at FAF, two are related to the General Proficiency (Grades I, II, and III); two are related to admission to GSA Graduates, one is related to admission to REPAHA Graduates, and the last is an open criteria which considers admission to persons over 26 years of age that pass the admission examination.

In December 2011, the Faculty of Agriculture and Forestry (FAF) had a total enrolment of 177 students. Of these, 119 are enrolled in Agriculture, 90 at Turkeyen and 29 at St. John's Science Centre; 58 in the Forestry Department, of these 46 and 12 in the Diploma Programme and Degree Programme, respectively.

Gender distribution of student provides interesting information. More females students are attracted to agricultural degrees, 48 are enrolled in Agriculture versus 42 males. On the contrary, fewer women are attracted to Forestry degrees, there only 16 women enrolled versus 42 males.

At Turkeyen, FAF provides a meeting room, where students can meet and study. There are no dining facilities, but students may purchase food from private canteens. The University does not provide dormitory accommodations nor cafeteria services.

3.2.3 Teaching Staff

The FAF has a total of 16 full time Lecturers, of these, 11 are in the Department of Agriculture and 5 in the Forestry Department. From the 11 Lecturers in the Agriculture Department, 9 are based in Turkeyen, 2 at St. John's Centre and 1 has a dual location base; 7 lecture in Crop Science and 4 in Animal Science. Of the 16 Lecturers, 4 also have administrative roles, 1 Dean, 1 Assistant Dean and 2 Head of Departments. Considering the total number of Lecturers, distribution of administrative responsibilities, geographical assignments and teaching roles, it may be concluded that Lecturers have a stressful workload which may considerably reduce time dedicated to the teaching-learning process, particularly practical opportunities; and time for research and extension activities. Therefore, this may negatively affect the quality of professional formation.

In Table 8, a summary of teaching staff is presented. In the FAF, of the 16 Lecturers 4, 11 and 1 hold a PhD, M.Sc. and B.Sc. degrees, respectively. In the

Agriculture Department, 4 Lecturers have a PhD degree, 2 in Animal Science and 2 in Crop Science. All four Lecturers in the Forestry Department have M.Sc. degrees. A brief analysis of this information shows that 93.8% of the Lecturers have qualifications at the M.Sc. level or above. Further segregation shows that 25%, 62.5% and 6.2% have PhD, M.Sc. and B.Sc. qualifications, respectively.

Table 8. FAF Staff Distribution by Department and Qualifications. December, 2011.

STAFF MEMBER	YEARS OF SERVICE	QUALIFICATION	DESIGNATION	DEPARTMENT/ BASE
Errol Luke	6	B.Sc. Animal & Poultry	Lecturer	AG/T
Patsy Francis	19	PhD Animal Nutrition, Microbiology and Food Technology	Lecturer / Head of Department	AG/T
Donna Morrison	17	M.Sc. Biology and Plant Science	Lecturer	AG/T
Arnold De Mendoca	8	M.Sc. Agriculture Diversification and Marketing	Lecturer	AG/T
Elroy Charles	10	PhD Insect Systematics	Assistant Dean / Lecturer	AG/T
Courtney Bullen	2	M.Sc. Soil Fertility	Lecturer	AG/T
Kaye Mc Allister	2	M.Sc. Agronomy	Lecturer	AG/T
Carmen Bacchus	4	M.Sc. Tropical Animal Production	Lecturer	AG/T
Subramanian Gomathinaya	5	PhD Botany/Plant Pathology	Lecturer	AG/B
Rajesh Kumar	1	PhD Zoology/ Aquaculture	Lecturer	AG/B
Bissassar Chintamanie	0	Master Technology	Lecturer	AG/B&T
Lawrence Lewis	7	M.Sc. Forest Engineering	Dean / Lecturer	FOR/T
Susy Lewis	6	M.Sc. Silviculture	Lecturer	FOR/T
Donna Ramdial		M.Sc. Environmental Forestry	Lecturer / Head of Department	FOR/T
Owen Bovell	7	M.Sc. Natural Resource Mgt.	Lecturer	FOR/T
Hosen Alam	0	M.Sc. Agroforestry	Lecturer	Fort/T

From this analysis it is safe to conclude that the proportion (93.8%) of post graduate qualifications is adequate, however, number of Lecturers is limited. There are only 4 Lecturers each, in Animal Science and Forestry. Therefore, numbers are limiting quality and delivery of competences. This situation is further complicated

by the results of an analysis of the information provided in Table 9, which shows fields of expertise practiced by Lecturers by level of qualification.

Table 9. Fields of Expertise of FAF Lecturers by Qualification. December, 2011

AREA	LEVEL OF LECTURER QUALIFICATION		
	B.Sc.	M.Sc.	PhD
Crop Science	Agronomy	Plant sciences; soil fertility; diversification and marketing; and technology management;	Botany and plant pathology; and entomology.
Animal Science	Animal and poultry Science	Tropical animal production	Animal Nutrition and Food Technology; and Zoology and Aquaculture.
Forestry		Forest engineering, silviculture, environmental forestry, natural resource management and agroforestry.	

Specialization at the PhD level only covers 4 fields, Animal Nutrition, Aquaculture, Plant Pathology and Entomology. At the M.Sc. level, the specialization fields covered are: Plant Sciences, Agriculture Diversification and Marketing, Soil Fertility, Technology and Tropical Animal Production. The B.Sc. holder is in Animal and Poultry Science. The specialization fields covered by the M.Sc. holders in Forestry are: Forest Engineering, Silviculture, Environmental Forestry Natural Resource Management and Agroforestry.

In Crop Science, FAF Lecturers' qualifications show only seven areas of expertise. Particularly notable is the narrow expertise in agronomy, soil conservation and management, irrigation and drainage, pest and disease management, farm machinery and equipment and rural development. Lecturers qualifications in Animal Science, shows only four fields of expertise. Among the noticeably absent fields the reader may identify, include animal husbandry, animal health, forage production, farm machinery and equipment, and rural development. The qualifications of Forestry Lecturers, only allow identifying four fields of expertise. It is also possible to notice absence of forest health, taxonomy, product transformation and product development. The absence of the following areas of expertise, rural development, extension, research, entrepreneurial ship, processing and marketing, product development, soil management, irrigation and drainage, and climatology is also concerning.

FAF hires part time staff to fill needs which vary from semester to semester. For example, during the academic year 2010-2011, six part time staff were hired with

specialization in chemistry, biometrics, agricultural engineering, physics, plant pathology/microbiology, and forestry.

3.2.4 Graduates

From its inception the School's plan was to produce 25 graduates per year. However, initial student enrolment was not as expected, of 25 students, six graduated, thereafter enrolment increased. It is considered that moving from the diploma level to the degree level was a step in the right direction.

Data shows that by 2011, the Faculty of Agriculture and Forestry had 422 graduates with a B.Sc. in Agriculture; approximately 28% of the graduates were female. In forestry, by 2011, 101 graduates had graduated with a B.Sc. in Forestry, of these approximately 41% were female and 184 graduates at the Diploma level.

Graduates of the Faculty contribute to the agricultural, fisheries and forestry sectors both locally and regionally. They fill key positions in private and public sector at both middle and senior management levels. The Faculty does not monitor alumni, and does not keep records of labour, further academic advancement, nor of performance.

3.2.5 Academic administration

3.2.5.1 Organization

The Faculty of Agriculture was established in 1977. A Diploma in Forestry was introduced in 1987 and a B.Sc. Degree in Forestry in 1996; hence in 2002 was renamed Faculty of Agriculture and Forestry.

Academic administration at UG follows a centralized model, in which the Vice-chancellor plays a prominent role. At the Faculty level, the leading role falls upon the Dean and the Head of Departments assist in the supervision of everyday activities. Since budget implementation is centralized at the Vice-Chancellor's level, the role of the Deans is to identify needs, request expenditures, keep track of allocations and provide accounting evidence for the few budget lines controlled by them. This model does not allow for planning at the Faculty level.

3.2.5.2 Finances

According to the Dean of FAF, the budget allocations are not sufficient to contract all needed staff and for operations. UG allocates funds based on a student: staff ratio, hence, the present low student enrolment places FAF at a disadvantage to

attract funds from the UG budget allocation. The FAF has not pursued mechanisms to generate funds through productive projects.

3.2.5.3 Academic affairs

FAF has developed mission, vision and strategic objectives; it is yet to establish these for the Departments. Admission and graduation requirements are well defined and shared with the student body. Other student rules and regulations are also in place.

The curricular are not standardized and must be done by programme. The existing grid may lead to confusion related to differences between Diploma and B.Sc. levels.

3.2.5.4 Staffing

The budget allocation does not allow hiring and maintaining an adequate number of staff required by the Departments. Salaries are low by Caribbean standards. This results in low staff motivation. FAF has a staff development programme which cannot be implemented due to lack of financial resources. There is evidence that staff have participated in many training opportunities and professional events, however, most of these opportunities have been financed by external sources. The development programme has not been actualized and implemented because the financial resources have not been available.

3.2.5.5 External relations

FAF has established relations with national and international institutions such as the Ministry of Agriculture, the National Agricultural Research and Extension Institute (NAREI), Guyana Sugar Corporation (GUYSUCO), Guyana Rice Development Board (GRDB), The Guyana Livestock Development Agency (GLDA), the Guyana School of Agriculture (GSA), the Barama Company Limited, Demerara Timbers Limited (DTL), the Guyana Forestry Commission (GFC), and the St. Stanislaus Farm. At the international level FAF maintains working relations with Universities throughout the Caribbean and the United States and Cuba. Good working relations are kept with the Inter-American Institute for Cooperation on Agriculture (IICA), the Food and Agriculture Organization of the United Nations (FAO), and the Caribbean Agricultural Research and Development Institute (CARDI). The forestry programme is well supported by the Barama Company Limited, Demerara Timbers Limited (DTL) and the Guyana Forestry Commission (GFC).

3.2.6 Teaching Resources

3.2.6.1 Financing

Table 10, is constructed from data provided by FAF. The total budget for FAF in 2011 amounted to GY\$ 52,941,850. Of these GY\$ 40,790,000 are direct staff related costs, GY\$ 36,510,000 for Turkeyen and GY\$ 4,280,000 for Berbice. Other costs for both campuses amounted to GY\$ 12, 150,000. A simple partial breakdown of other costs shows that GY\$ 8,570,500 are related to direct teaching activities; staff related other costs add to GY\$ 940,400; office related costs are 2,110,000; and direct student related other costs amount to only GY\$ 530,000. Then direct student related other costs, are 4.36% of the total other expenses budget or 1.30% of the total FAF budget. The available operating budget (teaching related other costs) is then GY\$ 8,570,500 or 70.53% of other costs or 21.01% of the total FAF budget.

TABLE 10. Approved 2011 FAF Budget.

BUDGET ITEM	AMOUNT GY\$	AMOUNT US\$
Staff Salaries and Emoluments	40,790,000	203,950
Total Other Costs	12,150,900	60,755
• Teaching Costs	8,570,500	43,650
• Staff Related Costs	940,400	17,105
• Direct Office Costs	2,110,000	10,550
• Direct Student Related Costs	530,000	10,550

3.2.6.2 Facilities

- **Classrooms**

FAF infrastructure and equipment is distributed in two campuses, Turkeyen, the main campus, near Georgetown and St. John's Science Centre at Berbice. Between both campuses, there are 11 classrooms, with 3 at Turkeyen and 8 at Berbice, the latter, are shared with the Faculty of Science. The Faculty Meeting room at Turkeyen is sometimes used as a classroom, as is the auditorium at Berbice. The combination of these facilities, which can host 690 students at a given time, provides an adequate coverage at Berbice, but not at Turkeyen.

An *in situ* observation of the classroom allowed verifying their present condition. Infrastructure at Turkeyen is in fair condition. However it was possible to observe the need for a more comfortable teaching environment, in terms of air conditioning, lighting, painting and furniture.

- **Staff Offices**

Office space for Lecturers is inadequate. All academic staff are currently housed in six (6) rooms. Staff have to share offices. There is need for four offices to accommodate Staff. Equally deficient are washroom facilities for both staff and students.

- **Library**

The University's Library is available for all students' use. The UG library is a depository for FAO documents. The stock of books at the UG library is adequate and has access to up-to-date information through scientific journals and on-line through 12 computers. However, 95% of the books available were published more than ten years ago. There is correspondence with other libraries for example NAREI and GRDB. Access to the UG Library is on a 24 hour bases and weekends up to five in the afternoon. The librarian did mention a low library use by students from FAF. The Faculty has a reading room / small library located in the Forestry building which houses a collection of forestry and agriculture reading material. The Reading Room has a very small stock of reference and journals and access to on-line information is also very limited, for example, on the day of the in situ observation, of the four computers in the FAF reading room, only two were functioning, and one of these was for staff use. The St. John's Science Centre also has a library for all students' use.

- **Laboratories**

FAF has a total of 3 general laboratories, in which all practises are developed. At Turkeyen, each laboratory is supervised by one technician. Both laboratories require urgent rehabilitation of the infrastructure and the replacement of furniture. The absence of biosafety measures (appropriate fume hoods, written safety protocols, written laboratory rules and regulations, and dress code). Most of the laboratory equipment was purchased between 1990 and 2000.

The *in situ* observation of the laboratory facilities and equipment at Turkeyen allow concluding that neither the facilities nor the available equipment are adequate to deliver most competences necessary for the integral and practical formation of students. In disadvantage are forestry students.

- **Computer Facilities**

There are a total of 17 computers at the Faculty of Agriculture and Forestry. The library contains four computers for students' use, while the remaining 13 computers

are utilized by teaching and support staff. The computers are assigned to the Dean, Assistant Dean, and Dean's Personal Assistant, lecturers' and support staff. However, the unstable power supply affects staff's work output efficiency. Most computers have access the Faculty's WIFI internet service, but the bandwidth is limited. Hence, the level of connectivity fluctuates and is often unreliable. At Turkeyen, the Faculty has 1 laptop computer and 1 projector, which aid in the delivery of some classes. There is a plan to purchase another projector. The ratio 37 students:1 computer at Turkeyen, is not adequate. However, when only one computer functions, the ratio is very inadequate.

At Berbice, currently there are 2 laptop computers and 2 projectors that aid in the delivery of agriculture classroom sessions. Four lecturers currently deliver courses at the Division of Agriculture. They have their own office space with a computer each. They are all connected to St. Johns' WIFI Internet network. Students are allowed access to 2 of these computers.

- **Farm**

The FAF does not have a research farm, it does however, run two farms for student practises. The farm at Turkeyen is used for the practical aspects of crop science courses. It has a small orchard with cherries, sour-sop, bananas and citrus. Other crops such as peppers, ochre, plantains and tomatoes are also cultivated at the Centre. Due to drainage and irrigation problems, only a small portion of the farm is currently under cultivation. At Berbice, there are two small poly-houses, which are utilized by both lecturers and students for practical work. It also has a field, which is underutilized.

It is evident that the farms offer limited practice opportunities for plant science or forestry students. Both farms do not keep record of land use, lack a field plot-use management programme, tools and equipment to deliver a balanced theory-practice academic programme and the required competences for an integral formation of the students.

- **Equipment**

Teaching equipment (projectors, screens, models, etc.) need to be replaced and increased to facilitate the teaching-learning process. Laboratory and farm equipment is old, out-dated, in poor working condition, and in some cases not in sufficient amounts. The FAF should make provision to draft and implement equipment maintenance and replacement plan. The FAF does not have vehicles for transport.

3.3 SWOT Analyses

The second component in the effort to strengthen their capacities to deliver more competent and functional graduates an analysis by a Strengths, Weaknesses, Opportunities and Threat (SWOT). This section, presents the results of the analysis undertaken by Lecturers of both institutions. As opportunities and threats were seen to be similar for both institutions, a joint analysis was performed, while individual strengths and weaknesses analyses were conducted for GSA and FAF.

3.3.1 Opportunities and Threats

The most relevant opportunities identified are detailed in Table 11; these include: the availability of funds from Government institutions and supporting international organizations, through on-going initiatives such as the Grow More and the Agricultural Diversification programmes, which can be accessed by both GSA and FAF. Lecturers also identified the natural resource base, as a source for research and extension work to increase sustainable utilization and conservation of soil, water, biodiversity and genetic resources. Furthermore, funds are to be available to rehabilitate and provide adequate infrastructure, equip laboratories and the practice farm and other academic initiatives at UG. To take advantage of these opportunities, GSA and FAF must up-date their knowledge and technological inventory; increase the staff's capacity to undertake research and extension activities, relevant and pertinent to the needs of the agricultural sector and society; and increase the capacity to develop and implement quality project proposals.

That the agricultural sector is headed towards open international markets, with finished products, where efficiency, productivity, competitiveness and quality-safe products are required, is also seen as an opportunity by the Lecturers, as competent agricultural professionals will be demanded to lead this venture of the sector. This requires from both institutions serious undertakings to deliver curricula relevant and pertinent to the sector and society, to form professionals with the competences (knowledge, skills, attitudes and values), among which practical and entrepreneurial skills are highly demanded. Hence, increased staff capacity, the transformation of infrastructure, modernization of equipment, increased access to up-dated information, increased technology generation and delivery capacity, more effective opportunities for students to acquire pertinent practical and entrepreneurial skills, innovative instructional methods and a reformed educational model will need to be in place to deliver the demanded professionals.

A major threat identified by lecturers is the low-value perception Guyanese society has of agricultural activities. Coupled to this, is that agriculture is not perceived a business, distorting the management, financial, technological, and cultural

dimensions of agriculture. As a result, active stakeholders are deserting and young people are not attracted to initiate agricultural enterprises. This poses many challenges to Guyanese educational institutions. First challenge is to change these erroneous perceptions, which keep agriculture at a low managerial and technology level and as a tradition-driven enterprise; and transform it into a recognized effective and dignified way to generate income. The second challenge is to attract higher level candidates for admission and form them with the required competences. This can be accomplished if the low esteem sentiment persistent among farmers, agricultural educators and professionals is reversed. Internally, measures also need to be taken to attract more high level staff and to motivate present staff with more attractive salary-emolument packages.

Finally, the forging of alliances with compatible partners is seen as an opportunity. Institutional strength is a comparative advantage when negotiating alliances, particularly with stronger stakeholders. The ever-present issues in forging alliances, are the contributions and benefits of the stakeholders, in the alliance. In win-take negotiations, usually, the strongest fairs better. GSA and FAF have had many positive collaborative experiences in the past, and therefore, can easily forge an alliance, in education, research and extension, and with augmented strength and capacities, sit as one, at negotiation tables to establish national and international alliances. For this purpose, a first step could be the integration in a scientific-technological alliance, which would curtail institutional weaknesses and provide advantages and benefits to both institutions.

TABLE 11. Opportunities for GSA and FAF. 2011.

OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Funding available from Government institutions (NAREI, GLDA, GRDB, UG) through new Government initiatives. • Funds available from IDB and WB for production and education, respectively. • A large natural resource base. • Education and training capacity. • New sociocultural niches. • Increased demand for education and training in new competences. • Increased production and productivity demanded. • Increased student intake. • Potential institutional alliances. • More active graduates. • Increasing social needs of trained professionals. 	<ul style="list-style-type: none"> • Biased funding policies, slow disbursement and low access to funds. • Increased costs. • Strong competition for funds from Government agencies. • Occurrence of floods. • Low self-esteem among agricultural professionals and farmers. • Perception of agriculture as a low class activity. • Agriculture is not seen as a business. • Low salaries and emoluments for agricultural professionals. • Brain drain. • Decreasing student intake.

3.2 Strengths and Weaknesses at GSA

The strengths identified by the lecturers include, the reliable government funding source, over which the School has complete control (Table 12). Other strengths include the school facilities and trained staff. While weaknesses, include the state of deterioration of facilities and obsolescence of equipment. Another important weakness identified is the out-of-date information and technology available to both staff and students.

TABLE 12. Strengths and Weaknesses of GSA. 2011.

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Reliable funding sources. • Full control over finances. • Available infrastructure and other working resources. • Food processing plant. • Available staff. 	<ul style="list-style-type: none"> • Deteriorated infrastructure. • Poor condition and obsolescence of the equipment. • Low genetic potential of farm animals. • Low technological capacity of laboratories. • Out-dated information. • Low farm productivity. • Obsolete technology.

3.3 Strengths and Weaknesses at FAF

FAF Lecturers identified as a strength (Table 13) the Faculty's capacity to attract outside funding and more students and a competent administration of resources. Also identified as strength, is the quality of staff, which also possesses a high level of social consciousness, access to information and well defined curricula. Among relevant weaknesses Lecturers identified the lack of control over the budget, the centralized management style and the limited capacity of grant proposal development to capture funds. Also an important weakness is the poor state of facilities and equipment and the lack of an experimental farm, which does not allow field research to be implemented. Perhaps the most critical weakness identified by Lecturers is the low motivation of the overworked and under-paid academic staff.

Table 13. Strengths and Weaknesses of FAF. 2011.

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Ability to attract outside funding and grants. • UG funding policy based on student enrollment. • Access to information. • Available trained staff. 	<ul style="list-style-type: none"> • No control over the budget. • Centralized management model. • Low tuition income. • Disproportionate student: lecturer ratio. • Poor condition of all infrastructure

<ul style="list-style-type: none"> • Increasing capacity to attract more students. • Well defined curricula. • Competent administration. • High level of social consciousness of staff. 	<p>and equipment.</p> <ul style="list-style-type: none"> • Limited capacity for grant proposal development. • Obsolete and limited laboratory capacity (equipment and skills). • Out-dated information. • Absence of experimental farm. • Poor organization of practice farm. • Inadequate security level. • Low staff designation level. • Low research and extension capacity. • Limited leadership. • Low planning and implementation capacity. • Low motivation among staff. • Limited capacity to implement improvement recommendations. • Excessive work load for staff. • Limited IT capacity and access to computers. • Poor staff and student accommodations. • Unattractive salaries and emoluments. • Amount and quality of research activities and publications. • Limited contact with stakeholders; very limited extension activities. • Low innovation capacity. • Limited contact and support to alumni.
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ANNEX 1

List of Lecturers and Officials Interviewed

At the Guyana School of Agriculture

- 1 Brian Greenidge, CEO
- 2 Grace Parris, Director of Academic Affairs
- 3 Yvette Best, Librarian/Lecturer

At the Faculty of Agriculture and Forestry

- 1 Lawrence Lewis, Dean
- 2 Pat Francis, Head of Department of Agriculture/Lecturer
- 3 Donna Ramdial, Head of Department of Forestry/Lecturer
- 4 Candice De Freitas, Administration Officer.

CHAPTER IV QUALITATIVE STUDY OF THE PROFESSIONAL DEMAND

1 INTRODUCTION

The Guyana School of Agriculture (GSA) and the Faculty of Agriculture and Forestry at the University of Guyana (FAF), proposed to strengthen their capacity to deliver the competent professional demanded by the agricultural sector and Guyanese society; with the assistance of the Inter-American Institute for Cooperation on Agriculture (IICA) through the development of curricula up to national and international standards; and improvement of the academic management capacity to deliver the curricula and innovative agricultural professionals with the competences to lead Guyana's agriculture towards the achievement of sustainable development. The second specific objective of the initiative is to describe the trends of agriculture, identify the functions, competences (knowledge, aptitudes, skills, attitudes and values) demanded of agricultural professionals, assess graduate performance and study the occupational and the professional demand.

The strategy of the study proposes two consultation tools to collect the information required, the first is a "focal group discussion". Five such groups were organized (Annex 2): 1) private and public sector, 2) lecturers, 3) GSA Students, 4) FAF Students and 5) graduates. This methodology entails the organization of the discussion groups to learn of subjects that fall outside the group's relation, but which are of common interest for all participants. As the title suggests, the study is not designed to quantify the occupational or professional demand, it is rather designed to: a) establish a frame of reference for the opinions and results, b) characterize the working scenario of future graduates, and c) gather the opinions of participants, in relation to new work scenarios, the required professional profile, the level of performance of graduates and of the demand and opportunities for future graduates. The second tool is direct interviews to sector stakeholders that because of their daily agendas, could not participate in the focal group discussions.

The focal group sessions and the interviews discussed four topics, trends and course in agricultural, forestry and rural development in Guyana; functions performed by professionals and tasks at medium and long term; performances of graduates as agents of change; and the present and future demand for professionals. This section summarizes and reports the opinions of participants in the focal groups and interviews.

2 TRENDS AND COURSE OF AGRICULTURE IN GUYANA

2.1 Trends, Course, Policies and Legislation in Agriculture

Informants agree that at present sugar and rice are the most important primary agricultural products, as they have been since the nineteenth century. Most informants agree that agriculture will continue to be an important sector in Guyanese economy and will maintain a positive growth trend. In the near future, in the opinion of informants, sugar and rice production will also continue to be important.

Sugar is produced primarily for export whereas most rice is consumed domestically. In Guyana, sugar production generates the highest revenue in the primary industry, between 28 and 32% of the total annual GDP. Other important crops include, bananas, plantains, coconuts, peanuts, coffee, cocoa, citrus fruits, peppers, and pumpkins and livestock commodities including beef, pork, poultry, dairy products, fish, and notably shrimp. Small amounts of vegetables, vegetable oil are also produced. Many of these products including rice are of extreme importance to national nutrition-food security. Guyana has achieved a high level of food security and has the capability to export food products.

With the exception of rice and sugarcane production, agriculture is seen as a subsistence venture. Agriculture is still based on traditional practices, rather than on new technological developments, for example market, policy, knowledge and technology. There is a general perception that Guyanese agriculture is technologically lags behind that of neighbouring countries. Farmers are not business-minded and therefore, agriculture is not seen as a business. This is seen to negatively affect equity building (capital accumulation) in the sector, hence, there is a high dependency on financial assistance and credit; and the level of technology used and job opportunities for agricultural professionals in the private sector.

Again, besides sugar and rice production, agriculture is perceived as a small-scale operation, practised by individual farmers with limited education and training, and if organized, these organizations are weak. This is considered a hindrance to increasing the level of technology used in agriculture, to assuring the reliability of product supply, to the delivery of agricultural extension services, to the provision of credit services and to input supply. It is also seen to be a constraint to move from primary production to agro-industrial agriculture”.

On a related issue, it is a general belief, that many academicians and agricultural professionals are equipped with out-dated knowledge and obsolete technical skills;

have limited practical and entrepreneurial skills and are disconnected from the realities and policies of the sector.

It is the opinion of most informants, that effective rural development programmes have been conspicuously absent from government initiatives. Most participants believe that sustainable community development and organization would enhance the future of agriculture, as would the strengthening of farmers' associations.

A generalised opinion is that Guyanese agriculture in "the past has been more oriented to primary production than to market"; in the future agriculture is "seen to be market-driven, will be more technology-driven and professional with higher standards of production". Agriculture will be "more diversified and farmers will be better trained and organized". In this respect, some informants are of the opinion that agriculture is shifting to more crop production in protected environments, livestock, fisheries/aquaculture, and forestry production for exports. It is also envisioned that agriculture will be geared to adding value to products for the export market; it will emphasize plant protection and food safety in product transformation and processing, to ensure product quality to meet national and international standards; and farm certification will be required." Participants are also of the opinion that agriculture will move towards the production of non-traditional crops and move from small-scale to large scale and intensive production systems.

Some informants agree that the initiative of Government to diversify agriculture has a holistic perspective and the necessary support for its implementation (financial, technology, training and information). Policies are seen to be focused on improving quantity and quality of products. However, it is also recognized by many informants that there are some policy, legislative, technological, knowledge, infrastructure, and operational needs to be filled, for example, service laboratories, processing skills, marketing skills and an effective research and extension service. However, it is recognized by other informants that this transformation still requires adjustments to policies and legislations.

The shift to the envisioned agriculture needs to be supported by improved policies that ensure equal access to information, technology and services. In the opinion of informants, the efficacy of agricultural policies varies. These policies need to be drafted through more participative mechanisms and are effectively diffused, furthermore, farmers and professionals must be also be able to take advantage of them. Agricultural loan requirements have to be reviewed and eased to make loans more accessible as risk management improves in the sectors. A policy to install agriculture insurance schemes is a recognized need by most informants. There is also need for more effective land-use policies - regulations, and for the use and conservation of the natural resource base. Product pricing policy has to be more

equitable and less consumer-biased. Access to information and technology also has to be more accessible to farmers.

Although it is recognized that recently the Government has launched a series of modern legislative measures (livestock health, seed production, food safety) to meet international standards, participants emphasized the need to modernize other sectorial legislation and the development of the capacity in Government institutions to exercise their normative, supervisory and statutory role. Areas identified by participants, include land use, water use, food quality and safety, marketing of food products, use of biodiversity, agrochemical use, environmental conservation and career accreditation and professional certification.

To accomplish the envisioned agriculture, participants also recognize that "this shift in agriculture requires changes in professionals and farmers". In the opinion of the participants, "farmers and professionals need to become more business-minded, better administrators, more efficient and competitive; they must re-tool with better technology and competences". "Professionals must also become more business-minded and actualize their knowledge and technological inventory."

Finally, in the opinion of participants, a serious challenge that the agricultural, fisheries, forestry and agro-processing sectors have to urgently address is "how to maintain agriculture attractive to farmers, professionals, politicians and investors." The fact that other sectors are gaining ground on agriculture, as contributors to the GDP, that farmers, professionals and investors are migrating to these up-coming sectors and less persons are interested in farming or to seek a career in agriculture is seen as a threat to agriculture. This trend is also influenced the popular perception "that agriculture is a low-class venture" and by the persisting "low remuneration at the farmer and professional level". Farmers and professionals must work together to reverse this trend.

2.2 Economic, Financial and Marketing Settings

A common consensus among participants is that agriculture is the "back-bone of Guyanese economy and will continue to be in the near future. Agriculture's contribution to the GDP will increase, once the diversification programme takes off and captures new markets. However, as mentioned before, they also recognize that other sectors are gaining ground. A factor related to this perception is that "consumer-biased pricing policies do not stimulate farmers to invest in agriculture."

A serious constraint to the sustainable development of agriculture, in the opinion of participants is that "agriculture is seen as a subsistence venture and not seen as a business." This poses a challenge to marketing, to the achievement of the

adequate scale of economy/production and to increasing productivity, efficiency and competitiveness in agriculture.

The limited entrepreneurial, administrative/management and risk management skills, is a recognized characteristic of both farmers/private sector and agricultural professionals, is what makes agriculture perceived as a high-risk venture by the financial sector. From there, the excessive collateral requirement imposed on agricultural loans. The high risk factor is increased by the use of inappropriate level of technology. Arising from this is the perceived low availability of financial support for agricultural production, particularly for the livestock sector and the absence of an agricultural insurance scheme. Banks and other financial institutions must be motivated to provide these services.

However, some participants believe that interest rates have had a downward trend in the past two years. Within the IDB project for agricultural diversification, the interest rates will be 5-8%; commercial rates range from 10 to 14%, depending on the industry. These loans will demand a collateral, such as mortgages, but as many farmers do not have title to land, equipment and leases to land may serve as collateral. Access to loans is perceived to be equitable, in terms of ability to borrow; but the collateral may be a hindrance. Loan recovery is very high, perhaps 90-95%, because of the required collateral. Microloans are available, there are two institutions that provide microloans (IPED and Small Business Development Finance), but high interest rates (20-24%) are applicable.

Marketing is considered as a challenge by many informers, because farmers and agricultural professionals are not business-minded. Hence, marketing skills need to be developed at all levels. Access to market information is now becoming a reality, but farmers need assistance to learn how to interpret and use this information. Another constraint in marketing recognized by informants, is the absence of a "chain value focus in agriculture", thus all services stop at the farm gate. Research, extension, credit and other services are required to allow farmers to take the next step into agro-industrial and market oriented agriculture. Access to markets on an equal basis was also identified as important by participants.

2.3 New Paradigms

Participants were able to identify new paradigms in the technology, economic, social, education and environmental fields. An analysis of the information provided by the participants permitted the identification of technology paradigms which include: the adoption of a production systems approach, mechanization (selection of the appropriate scale, use and maintenance of equipment); post-harvest technology and methods; irrigation and drainage, and precision farming.

Most informants agree that “the agricultural technology level in the country is too low, because of its costs”. Others expressed concern “of the farmers’ and professionals’ capacity to use it”. Some participants expressed “that agricultural technology may be available, but access is limited. Others point out “there is a need for more appropriate technology and extension work for its adoption”.

Other technology related paradigms identified are: “a functional research - extension linkage; product development and processing” ; energy management, biofuel, and use of second generation fuel production; crop and animal genetic improvement, and plant and animal health are also seen as important.” Finally, informants mentioned as important “all production factors need to be improved.

Environmental paradigms identified by participants include: effective use of biodiversity; water management, irrigation and drainage; soil use and conservation and fertilizer management; mitigation and adaptation to climate change, and appropriate land use planning.

Social related paradigms identified include farmer organization, achievement of sustained rural community development; improved relations among the public, private and education sectors, and sustaining national nutrition-food security.

Educational paradigms emphasized by participants are improved farmer education, through improved extension service and for higher education, to focus on science, agricultural economy, policy and agribusiness; this requires great flexibility in the curricula.

Finally in economy-related paradigms important in the opinion of participants are: “adoption of a chain value approach; developing a market research system and developing a participatory policy-development process; and changing farmers’ and society’s attitude towards agriculture”.

3 FUNCTIONS PERFORMED AND DEMANDED COMPETENCES

3.1 Functions and Tasks Performed by Professionals in the Medium and Long Term

The analysis of the information provided by participants allowed compiling an extensive list (see Table 14) of functions and tasks performed by professionals and those that will be demanded in the future. Among the most common functions identified are researchers, technical and research assistants; extension staff, teachers, and communicators; managers, financial and farm managers, administrators, supervisors, sales persons, and entrepreneurs; producers, farm

managers, scientists/experts in plant protection and soil science; policy-makers and politicians; food processing, and marketing; forest engineers; forest managers and conservation, land surveyors and laboratory technicians.

3.2 Competences Required

Participants were quite successful in identifying the competences (knowledge, abilities/skills, attitudes and values) demanded from graduates (Table 14) and agree with the statement "there is a disconnection between what is taught and what is needed in agriculture and that the knowledge and technology inventory of professionals is somewhat out-dated." They also feel that "professionals need to be more in line with the market and must lead agriculture; they need to understand policy and how to implement it."

Salient competences identified are **practical skills, post-harvest technology, processing technology, marketing, entrepreneurial, scientific and**

Table 14, Functions and Competences Demanded from Agricultural Professionals. Guyana.

FUNCTIONS	COMPETENCES			
	KNOWLEDGE	ABILITY/SKILL	VALUE	ATTITUDE
- Administrators	- Management	- To convince others	- Humility	- Good attitude towards work
- Development agents	- Economy	- Information technology	- Equality	- Occupational and professional vocation
- Trainers	- Finances	- Management	- Responsibility	- Desire to keep learning
- managers	- Project design and management	- Administration	- Solidarity	- Disciplined
- public employees	- Foreign language skills	- Product development	- Ethic	- Achievement oriented
- Private employees	- Personnel management	- Practical	- Honesty	- Business-minded
- Evaluators	- Forest management	- Theoretical	- Morality	- Entrepreneurial
- Extension	- Equipment management	- Innovator		- Efficient
- Researchers	- Mathematics	- Communicator		- Humble
- Teachers	- Report writing	- Social and environmental consciousness		- Motivated
- Farmers	- Human Relations	- Agribusiness		- Proactive
- Project managers	- Technology management	- Product development		- Self-assured
- Sales persons	- Production	- Policy making and analysis		- High aspirations and goal setting
- Supervisor	- Expertise	- Post-harvest management		- Respectful
- Technical assistants	- marketing	- Plant and animal health		- Passionate
- Consultants	- Planning	- Rural development		- Initiative
- Plant breeders	- Oral and written communication	- Instructional		- Innovator
- Politicians				- Creative
- Leaders				- organized
- Agribusiness persons				
- Forest				

engineers - Entrepreneurs - Research assistants - and laboratory technicians -	s - Evaluation - Diagnostic procedures - Science - Policy making and analysis - Information technology management - Agribusiness - Legislation - Sociology - Soil and water use and conservation - Microbiology - Statistics - Research Methods - Post-harvest and processing technology - Biotechnology	and extension methods - Development of instructional and extension materials - Practical - Innovation - Sociology - Irrigation and drainage - Soil fertility management - Entrepreneurial - Hydroponics - Organic farming - Organization - Good listeners - Know how to be - Cost benefit analysis and modelling - Farm machinery management - Team working - Analytical skills - Animal, production health and reproduction; - Food safety and quality control - To work in diverse job settings - Networking		- Auto-control - Visionary - Un-biased - Tolerant - Optimist - Perseverant - Flexible - Enthusiast - Competitive - Vigilant - Trustworthy
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innovation; and out-dated knowledge. Needed competences also include “economics, financial, social, statistics, policy analysis, technical knowledge, working with groups, management, production, human resource management, practical skills, mathematic skills, entrepreneurship, writing and scientific reporting skills, cost benefit analysis and modelling. Furthermore, they expressed “we need skills in mechanization” and “we need skills in biotechnology.” The participants also recognize that “extension requires good communication, planning and practical skills, and requires planning capacity”; “extension staff also need skills in development of instructional materials and need knowledge and skills in sociology.” In research, participants expressed “we are concentrated in quantity and not enough in quality; we need a balanced research approach and more knowledge in

research methods." Knowledge is required in: "microbiology, drainage, hydroponics, organic farming, animal health, economics, scientific skills, management of equipment; organization, planning, agribusiness, know how to interact with people, able to listen to people, desire to keep learning, good attitude towards work, use of information technology, scientific knowledge, to be innovative, to have vocation disciplined, and achievement oriented."

4 PERFORMANCES OF GRADUATES AS AGENTS OF CHANGE

4.1 Strengths in Performance

Informant's opinions of graduate performance are summarised in Table 15. Participants agree that in general "FAF graduates are theoretical; graduates are "good hard workers, disciplined, good communicators, self-confident, optimist, humanitarian and loyal, eager to keep learning and are passionate; graduates have a good work attitude, good theoretic knowledge the ability to convince others, and solidarity; and work well under pressure."

Graduates from GSA are perceived as "innovative, to have a good work attitude, work well under pressure, are good team workers, are proactive, have good practical skills, have good extension skills and can work in a diverse settings.

Summarizing, in general informers agree that professionals graduating from the Faculty of Agriculture and Forestry of the University of Guyana and from the Guyana School of Agriculture "are hard workers, passionate, enthusiastic, self-assured and committed, and have work ethic and the will to keep learning." It is also generally accepted that when compared to each other "GSA graduates have more practical skills and UG graduates have more cognitive skills" and "both have multidisciplinary skills allowing them to work with animals and crops." Another interesting opinion related to FAF graduates is that "they demonstrate very strong and very weak performances; the question is how the median can be raised."

4.2 Weaknesses in Performance

The major weaknesses recognised in UG and GSA graduates are "lack of practical, inter-personal, communication (written and oral), entrepreneurial, agribusiness, product processing, planning, problem-solving and design skills and limited analytical, critical thinking, and reasoning capacity (lecturers also seen to lack these skills)". Graduates are not seen as "proactive or innovative." Graduates are perceived to have "difficulty in relating to farmers and in communicating with others." It is also widely accepted by those interviewed that graduates have a low

Others identified the “**the lack of practical skills of graduates**” as the major weakness. Other weaknesses identified include “**the lack of entrepreneurial, financial, management and research skills of graduates**”

FAF graduates are seen to “lack of self-confidence and initiative; to have limited knowledge, poor communication (written and oral), computer, networking and report writing skills; and to be somewhat arrogant (do not respect authority)”. Most informants are of the opinion that FAF graduates have poor rural sociology and community development knowledge”. Finally, FAF graduates are weak in statistical analysis agrochemical management; crop protection knowledge and skills; entomology knowledge; administrative and accounting skills.

GSA graduates lack foreign language skills, vocation, motivation and policy-making skills; have low aspirations, and do not have entrepreneurial skills.

Table 15. Performance And Areas To Improve

STRENGTHS	WEAKNESSES	AREAS TO IMPROVE
<ul style="list-style-type: none"> - FAF graduates have a good knowledge level but out-dated - GSA graduates have good practical skills - Are hard workers and have a good attitude towards work - Work well under pressure - Are good communicators, - Are self-confident - Are optimist - Are passionate - Have the ability to convince others - Have solidarity - Are humanitarian and loyal - Presentation development skills 	<ul style="list-style-type: none"> - FAF graduates lack practical and design skills - FAF graduates are not innovators - GSA graduates have a low and out-dated knowledge level - All graduates lack research and extension skills - Low managerial, administrative, financial and entrepreneurial skills - Are somewhat arrogant - Lack vocation - Lack of self-confidence, - Lack of initiative, - Have poor rural sociology knowledge and community development 	<ul style="list-style-type: none"> - Research and extension skills - Project management - Increase opportunities for students to practise - More exposure to research and extension work - Personal attitude - Attitude to keep learning - Practical skills, - Up-date knowledge - Self-discipline - Personal development, - Innovation capacity - Communication skills - Networking an team working capacity - Entrance profile - Student evaluation standards - Alumni participation in the evaluation of graduate performance - policy analysis skills - Foreign language skills

	skills - Do not respect authority - do not know how to network - Low computer information and technology management skills - Low written and oral communication skills	
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4.3 Areas to Improve

Participants identified eight major areas to improve in agricultural education, these are:

1. Improve the curricula to make them more pertinent to the needs of the agricultural sector and relevant to society's needs." The curricula must "bridge science - technology to agribusiness and to policy. If these links are not understood by students and graduates, then agriculture will not develop"
2. Raise the academic standards, "those for admission, performance and evaluation".
3. Increase and up-date the knowledge and to practical skills of lecturers.
4. Develop the capacity to deliver post graduate training.
5. Strengthen and broaden the working relation between UG and the GSA.
6. Improve the teaching focus and use more appropriate instructional methods and the vision of the academic programmes must be widened and evolve to form innovative professionals.
7. Develop a strategy and programme to orient students in the selection of a suitable degree and to develop the attitude of **VOCATION**.
8. Develop and urgently implement a staff development programme for lecturers to up-date and strengthen their scientific knowledge and develop their practical skills. This strategy should include future opportunities through continuing education programmes for faculty staff and professionals.

These improvement suggestions must enhance the capacities of UG and GSA to deliver professionals "with better entrepreneurial, marketing, innovation, communication, interpersonal relations, critical thinking, reasoning, analytical, managerial and most of all, **PRACTICAL SKILLS** and higher cognitive levels in

science, economics and policy analysis to allow them to function in a food secure and net exporter society.”

Other areas to improve identified are “discipline, integral personal development, innovation capacity, and communication skills”. Other participants felt that there “is a need to improve the opportunities for student to practice and have more exposure to research and extension activities.” The participants are of the opinion that “entrance profile and student evaluation standards need to be increased and that alumni participation in the evaluation of graduate performance, including the establishment of a feedback channel is desirable.” Some participants believe that “policy analysis, communication language skills and knowledge levels, need to be improved”

5 PRESENT AND FUTURE DEMAND FOR PROFESSIONALS

5.1 Present and Future Demand

At present, there is a large need for well-trained agricultural professional; however, the demand is low, in other words, despite the need, no one is hiring. Some informers agree that “there is a moratorium in hiring within the agricultural sector; while others agree “that the lack of a solid and continuous agricultural plan is one of the major causes for the low demand.”

The demand for agricultural professionals by the private sector is considered “low”, because of the family nature of most enterprises; others consider the cause for a low demand for agricultural professionals “is that agriculture is not seen as a business, therefore, the need to hire professionals is not felt”. While other informers attribute the low demand “to the paternalistic nature of the sectorial policies, which provide professional services at no or at low cost to the private sector”.

On the other hand, some private sector participants believe “that there is a large and growing demand that is not being met because of the lack of competent and thinking professionals”. Others believe there is a demand “because of the vacuum left by the large migration of professionals. These informers added “the demand is there for good professionals with knowledge and practical skills”. Some stakeholders believe that the demand “will need to be met by importing trained professionals and by training nationals.”

Most participants agree that there is and will be demand for agricultural professionals. They do however recognize differences among fields of action. For example they expressed “at present there is a demand for qualified professionals in teaching and product processing”. Other participants added “there is a demand for

professionals that have knowledge and skills in post-harvest technology, report writing, human resource and middle management." Still, other participants believe that "there will not be a demand in fisheries"; but that "there is a high demand in forestry and agro-industry for educated professionals".

Many participants expressed the concern "there is a demand, but experience is required, therefore, recent graduates are at a disadvantage." They point out along the same line "there is a demand, but the supply may dwindle, more candidates need to be attracted to study agriculture by increasing remuneration." Participants point out "the on-going transformation in agriculture has increased the demand for professionals in government, particularly in policy-making and analysis and in the private sector, as entrepreneurs in vegetable, production, marketing and processing." Lecturers expressed "the low remuneration of services causes desertion of professionals to other fields of work". They also expressed the concern "Guyanese companies are hiring foreign companies to manage their production."

In the future there will be a demand for well trained professionals, with competences in "agribusiness, farm management, research, extension, irrigation and drainage, animal production, entomology, pathology, agricultural economics, and food technology, among other." Some stakeholders believe that the demand for competent professionals will grow at the national and regional level." Most agree that "in the near future, the public sector will continue to be the largest employer."

5.2 Opportunity for Entrepreneurial Professionals

Most participants recognised that there are opportunities for young entrepreneurial professionals; however, they do accept that certain conditions do apply. Many participants are of the opinion that if the diversification programme is able to capture markets, then the opportunities for entrepreneurial professionals will increase." Yet, other informants agree that opportunities for entrepreneurial professionals are limited. It was a consensus among participants that more training, marketing skills are needed, and the flow of information must be improved for opportunities to be there for young entrepreneurs.

ANNEX 1

5.1 List of Stakeholders Interviewed. 2011

	NAME	INSTITUTION/ ENTERPRISE	SECTOR	POSITION
1	Rory Fraser	FAF	ACADEMIC	VIS. PROF.
2	Kelvin Craig	CONSULTANT	PRIVATE	NA
3	John Browman	CONSULTANT	PRIVATE	NA
4	Oudho Homenauth	NAREI	PUBLIC	CEO
5	George Jarvis	MOA	PUBLIC	PS
6	Elizabeth Ramral	ASDU/MOA	PUBLIC	DIRECTOR
7	Nizam Hassan	NGMC	PUBLIC	GM
8	Dindyal Permaul	GLDA	PUBLIC	CEO
9	Nicholas Waldron	GLDA	PUBLIC	CEO
10	Nigel Cumberbatch	GLDA	PUBLIC	
11	Jagnarime Singh	GRDB	PUBLIC	CEO
12	Ramesh Persaud	IPED	PUBLIC	CEO
13	Omadatt Chandam	NDIA	PUBLIC	CS
14	David Fernandes	BOUNTY FARMS	PRIVATE	PRESIDENT
15	Rodlyn Grant	GFYA	PRIVATE	PRESIDENT
16	Clinton Williams	GMSA	PRIVATE	PRESIDENT
17	John Tracey	GBTI	PRIVATE	CEO
18	Ramesh Dookhoo	PSC	PRIVATE	CHAIRMAN

Participants in the Graduate Focal Group Session. November, 2011

Patrick Chesney
 John Wolford
 Selwyn Anthony
 Michael Welch
 Christopher Persaud
 Steve Mangal
 Jermaine Joseph
 Richard Blair
 Maxine Parris-Aaron
 Arnold De Mendoca

Participants in the Public and Private Sector Focal Group Session. October, 2011.

Courtney
 Davis
 Ivan
 Tequila

Participants in the Lecturers Focal Group Session. October, 2011

Timothy Rutherford
Arnold De Mendonca
Elroy Charles
Rory Fraser
Lawrence Lewis
Malcolm Emberton
Pat Francis
Coretta Samuels
Ignatius Jean
Dr. Sadeek
Shameit Bali
Cesar V. Legion
Oscar Glasgow
Lynette Cunha
John Browman
Grace Parris
Carmen Bacchus

Participants in the GSA Focal Group Session. October, 2011.

Joseph smith
Donnica Thornhill
Faye James
Jamal Watson
Shellon Younge
Troy Crawford
Alicia Thom
Louis Primo
Abiola Simpson

Participants in the FAF Student Group Session. October, 2011

Royston Peters,
Ushanta Bentinck,
Jeremy Artega,
Tackchandra Indar,
Chandrashekar Jainarain

Sherwin Prince
Nehal Patterson
Bernice Anthony
Tricia Blenman
Chris Alleyne
Kevin Moore

CHAPTER VI IMPROVEMENT PLANS

1 INTRODUCTION

The Improvement Plans to be drafted have the purpose to strengthen the capacity of GSA and FAF to deliver de curricula that assure the delivery of the competences demanded of professionals by the agricultural, fisheries, forestry and agro-industry sectors and the Guyanese society. The areas and factors suggested to improve were identified through comprehensive analyses of the information gathered through the external and internal diagnostic studies. By no means is the suggested factors are exhaustive, nor are the areas to improve.

2 QUALITATIVE STUDY OF THE PROFESSIONAL DEMAND: AREAS TO IMPROVE

Participants in the Qualitative Study of the Professional Demand identified eight major areas to improve in agricultural education, these are:

9. Improve the curricula to make them more pertinent to the needs of the agricultural sector and relevant to society's needs." The curricula must "bridge science - technology to agribusiness and to policy. If these links are not understood by students and graduates, then agriculture will not develop"
10. Raise the academic standards, "those for admission, performance and evaluation".
11. Increase and up-date the knowledge and to practical skills of lecturers.
12. Develop the capacity to deliver post graduate training.
13. Strengthen and broaden the working relation between UG and the GSA.
14. Improve the teaching focus and use more appropriate instructional methods and the vision of the academic programmes must be widened and evolve to form innovative professionals.
15. Develop a strategy and programme to orient students in the selection of a suitable degree and to develop the attitude of **VOCATION**.
16. Develop and urgently implement a staff development programme for lecturers to up-date and strengthen their scientific knowledge and develop their practical skills. This strategy should include future opportunities through continuing education programmes for faculty staff and professionals.

These improvement suggestions must enhance the capacities of UG and GSA to deliver professionals "with better entrepreneurial, marketing, innovation, communication, interpersonal relations, critical thinking, reasoning, analytical, managerial and most of all, **PRACTICAL SKILLS** and higher cognitive levels in

science, economics and policy analysis to allow them to function in a food secure and net exporter society.”

Other areas to improve identified are “discipline, integral personal development, innovation capacity, and communication skills”. Other participants felt that there “is a need to improve the opportunities for student to practice and have more exposure to research and extension activities.” The participants are of the opinion that “entrance profile and student evaluation standards need to be increased and that alumni participation in the evaluation of graduate performance, including the establishment of a feedback channel is desirable.” Some participants believe that “policy analysis, communication language skills and knowledge levels, need to be improved”.

3 DIAGNOSTIC STUDIES: FINDINGS AND RECOMMENDATIONS

In situ observations allowed to observe the facilities and equipment at GSA and FAF, as well as to review institutional documents and interview staff and officials (Annex 1). Both GSA and FAF have similar limitations in terms of curricula, students, staffing, graduates, academic administration and teaching resources (see Tables 1 and 2).

Curricula offered at both institutions have limited flexibility and lack the scope of contents and practice opportunities to allow students to graduate with appropriate levels of demanded competences such as knowledge in professional fields of action, practical and entrepreneurial skills. Of particular concern is the lack of self-confidence and vocation identified in graduates.

Staffing at both institutions does not meet the needs to deliver the on-going academic programmes. In general the number of academic staff is less than adequate, it does not possess the width of specialization scope necessary to deliver the curricula, it overburdens staff, not only with academic duties, but it also administrative duties on lecturers. Also critical is the lack of staff time to undertake research and extension activities.

In terms of funding, budgets do not cater for efficiently delivering the programmed academic activities. However, at GSA, sale of farm products complements the received subventions. The most important impact of the shortage of funds is the possibility of having adequate staffing, implementing research and extension activities and more student practice activities.

Perhaps at FAF the facilities are in a more precarious situation and in need of urgent refurbishment. As far as laboratory and farm equipment, both Institutions

need to implement maintenance and replacement plans. The lack of control over the budget and centralized management style, at FAF, does not allow the implementation of a plan of operations, let alone a strategic development plan. Access to up-to-date information and technology is a hindrance to both GSA and FAF.

Table 1 Findings and Recommendations for GSA

FINDINGS	RECOMMENDATIONS
<p>CURRICULA</p> <ul style="list-style-type: none"> • The academic differences between Certificate and Diploma levels are not clear. • From the information provided, it was not possible to identify the total amount of credits related to practical activities. • The curricula lack academic and administrative flexibility. There are no elective courses. • The opportunity for research-extension and for personal development courses is limited. • Notable absences from the curricula are information technology, natural resource management and entrepreneurial topics. Very few credit hours are allocated to fruit and vegetable production, soil management and conservation, irrigation and drainage, extension methods and personal development. 	<p>CURRICULA</p> <ul style="list-style-type: none"> • Develop curricula based on competences. • Introduce curricula, instructional and administrative flexibility. There are no elective courses. • Develop and implement a participative curricula development, monitoring and evaluation system. • Ensure that there is an adequate and balanced relation between theory and practise hours. • Provide more opportunities for student practise through research and productive projects, and internships. • Ensure a coherent coordination classroom – practise contents • Clearly define the instructional model to follow. • Include personal development opportunities.
<p>STUDENTS</p> <ul style="list-style-type: none"> • Admission, student performance and graduation requirements are. • Students do not participate in curriculum development and evaluation. 	<p>STUDENTS</p> <ul style="list-style-type: none"> • Raise the level of admission requirements and performance standards. • Implement a mechanism to allow student participation in curriculum development and evaluation. • Develop and implement a strategy to socialize the professional profiles and course outlines and to attract student candidates.
<p>LECTURERS</p> <ul style="list-style-type: none"> • There are more part time than full time lecturers, hence, a disproportion exists between full and part time staff. • Many staff members also have 	<p>LECTURERS</p> <ul style="list-style-type: none"> • Update and adequate a staffing and staff development programme, including training, opportunities of gaining practical and research experience, a

<p>administrative duties, so the workload may be heavy for full time teachers.</p> <ul style="list-style-type: none"> • When considering only full time teachers the student: teacher ratio is acceptable, however, when part-time teachers are included the ratio drops to a tight ratio, compromising efficiency. • There is a heavy dependency on part time lecturers to deliver the academic programmes, which diminishes tutoring and other opportunities for students. • There is a limited scope of expertise of full time staff. • Research responsibilities are not included in the terms of reference of the lecturers. • The staffing and staff development programme has not been actualized and implemented because the financial resources have not been available. • Teachers are seen to have limited entrepreneurial skills and out-dated knowledge. 	<p>competitive remuneration scheme based on performance and contributions.</p> <ul style="list-style-type: none"> • Increase the number of full time teachers. • Provide more opportunities for practice, research and entrepreneurial activities.
<p>GRADUATES</p> <ul style="list-style-type: none"> • There is no evidence of the participation of the Alumni Association in the development of curricula. • There is no evidence of continuing education opportunities or actualization courses for graduates. • Graduates are seen to have limited entrepreneurial skills and out-dated knowledge. 	<p>GRADUATES</p> <ul style="list-style-type: none"> • Implement a mechanism to allow for graduate participation in the development and evaluation of curricula. • Implement a feedback mechanism from graduates. • Implement a continuing education programme for graduates. • Contribute to the strengthening of the alumni association. Develop a certification system.
<p>ACADEMIC ADMINISTRATION</p> <p>Organization</p> <ul style="list-style-type: none"> • The organizational structure is light, however, the number of board members which may be too many. <p>Financing</p> <ul style="list-style-type: none"> • There is no evidence of regularity of capital allocations from government and of endowment funds and fund-raising campaigns. • Funding for operations and for equipment maintenance and reposition is limited. 	<p>ACADEMIC ADMINISTRATION</p> <ul style="list-style-type: none"> • Promote alliances with the public and private sectors. • Widen the scope of specialization and hire more full time lecturers • Introduce more administrative flexibility in the curricula delivery. • Include research and extension responsibilities in the terms of reference academic staff and establish research and extension programmes. • Introduce more flexibility in the curricula delivery. • The agro-processing plant should adopt and practise the guidelines of the <i>Codex Alimentarius</i> and implement a hazard analysis and critical control points

<p>Academic Affairs</p> <ul style="list-style-type: none"> • The curriculum lacks administrative flexibility as the students have no choice of lecturers or schedule to register for courses. None of the programmes offer elective courses to suit the students' vocation or personal development needs. • The presentation of the curricular grids/course outlines are not standardized and done by programme. • The existing grid may lead to confusion, given the difficulty to differentiate between Diploma and Certificate levels. 	<p>(HACCP).</p>
<p>TEACHING RESOURCES</p> <p>Facilities</p> <ul style="list-style-type: none"> • Air conditioning and better lighting in the classrooms would enhance the learning process. • Most student desks and other classroom furniture need to be replaced. • All laboratories lack adequate biosafety measures (signs, safety protocols, appropriate fume hoods, etc.). • All laboratories infrastructure needs to be rehabilitated. • The library setting is appropriate, although furniture replacement air conditioning and better lighting, would improve the environment. • The computer facilities are adequate. • The size of the farm is more than adequate to provide for student practice. • There is a need to improve plot management by keeping adequate records of land use and establishing appropriate crop rotation patterns. • Animal facilities (stables and pens) need rehabilitation to provide adequate comfort conditions for animals and a better learning experience for students and visiting farmers. • The agro-processing plant has an appropriate scale and is adequate for the level of teaching-learning demanded by the academic programmes. • The processing plant storage facilities, both for dry good and cold storage are not adequate. • The biosafety measures are not adequate, such as safety protocols 	<p>TEACHING RESOURCES</p> <p>Facilities</p> <ul style="list-style-type: none"> • Rehabilitate and adequate facilities for each purpose (classrooms, labs, farm, processing plant, etc.) • Establish appropriate biosafety protocols in all processes and facilities. • Introduce elements of well-being (lighting, ventilation furniture, etc. in all facilities • Develop and implement a comprehensive farm development and management plan. <p>Equipment</p> <ul style="list-style-type: none"> • Develop and implement an equipment maintenance and replacement plan. Develop the internal capacity to maintain equipment. • Develop and implement a library book replenishment programme.

<p>should be more visible; waste management protocols are needed; and more fire extinguisher alternatives are also needed.</p> <p>Equipment</p> <ul style="list-style-type: none"> • Teaching equipment (projectors, screens, models, etc.) need to be replaced and increased to facilitate the teaching-learning process. • Laboratory and farm equipment is old, out-dated, in poor working condition, and in some cases not in sufficient amounts. • At the agro-processing plant, some of the equipment should be replaced, such as autoclaves, packing and abattoir. • Computer equipment (in all facilities) needs to be replaced. • Farm equipment is limited and outdated. • Most of the books available at the library were published more than 10 years ago. <p>The School has some vehicles for transport, but it is deficient in number and needs replacement.</p>	
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Table 2. Findings and Recommendations for FAF.

FINDINGS	RECOMMENDATIONS
<p>CURRICULA</p> <ul style="list-style-type: none"> • The present course outlines do not follow a common format and have limited curricular, instructional and administrative flexibility. The present Forestry curricula share some of the weaknesses with those of Agriculture. These are somewhat more rigid as only two elective courses are offered. • The ratio core: elective courses (80: 20) is appropriate. • By regional standards, the number of credit hours (137) for a Bachelor of Science degree may be considered low. • Basic science courses for crop and animal science are limited. Also 	<p>CURRICULA</p> <ul style="list-style-type: none"> • Develop curricula based on competences. • Ensure that there is an adequate and balanced relation between theory and practise hours. Consider adding missing science and professionalization courses. • Introduce curricula, instructional and administrative flexibility. There are no elective courses. • Develop and implement a participative curricula development, monitoring and evaluation system. • Clearly define the instructional model to follow. • Ensure a coherent coordination classroom – practise contents

<p>limited are courses related to ITC, irrigation and drainage, natural resource management and environmental conservation; and legislation and policy and entrepreneurial development.</p> <ul style="list-style-type: none"> • Research competences are limited, with only one course in biometrics; not enough content is offered on statistics, experimental designs or research methods. • There are limited opportunities for students to practice. 	<ul style="list-style-type: none"> • Include personal development opportunities. • Provide more opportunities for student practise through research and productive projects, and internships.
<p>STUDENTS</p> <ul style="list-style-type: none"> • The admission, student performance standards and graduation requirements are low. • Students do not participate in curriculum development and evaluation. • Student performance standards need to be raised. • There are no dining facilities, but students may purchase food form private canteens. The University does not provide dormitory accommodations or cafeteria services. 	<p>STUDENTS</p> <ul style="list-style-type: none"> • Raise the level of admission requirements, performance standards and graduation requirements are low. • Implement a mechanism to allow student participation in curriculum development and evaluation. • Develop and implement a strategy to socialize the professional profiles and course outlines and to attract student candidates.
<p>LECTURERS</p> <ul style="list-style-type: none"> • Given the total number of lecturers, distribution of administrative responsibilities, geographical assignments and teaching roles, it may be concluded that they have a stressful workload that may considerably reduce time dedicated to the teaching-learning process, particularly practical opportunities; and time for research and extension activities. Therefore, this may negatively affect the quality of professional formation. • Research responsibilities are not included in the terms of reference of the lecturers. • When considering only full time 	<p>LECTURERS</p> <ul style="list-style-type: none"> • Update and adequate staffing and staff development programmes, including, contracting, training, opportunities of gaining practical, entrepreneurial and research skills and a competitive remuneration scheme based on performance and contributions. • Include research and/or extension responsibilities into the terms of reference of the Lecturers.

<p>teachers the student: teacher ratio is acceptable.</p> <ul style="list-style-type: none"> • There is a limited scope of expertise available through full time staff. • The proportion (93.8%) of post graduate qualification of lecturers is adequate; however, the number of Lecturers is limited. • The staff development programme has not been actualized and implemented because the financial resources have not been available. • Lecturers are perceived to have limited practical, entrepreneurial and research skills and out-dated knowledge. 	
<p>GRADUATES</p> <ul style="list-style-type: none"> • The Faculty has delivered 422 B.Sc. graduates in agriculture (16.5 graduates/year), 184 B.Sc. graduates in Forestry (8.36 graduates/year), and 101 graduates with a Diploma in Forestry (5.9 graduates/year). • There is no evidence of a follow-up mechanism of graduates and of an alumni association. • There is no evidence of the participation of the Alumni Association in the development of curricula. • There is no evidence of continuing education opportunities or actualization courses for graduates. • Graduates are perceived to have limited practical, entrepreneurial and research skills and out-dated knowledge. 	<p>GRADUATES</p> <ul style="list-style-type: none"> • Develop and implement institutionalized linkages to follow-up graduates; including a feedback mechanism. • Implement a mechanism to allow for graduate participation in the development and evaluation of curricula. • Implement a continuing education programme for graduates. • Contribute to the development of the alumni association. Develop a certification system.
<p>ACADEMIC ADMINISTRATION</p> <p>Organization</p> <ul style="list-style-type: none"> • The administrative structure is light; the levels are Dean, Assistant Dean, and Heads of Departments. <p>Financing</p>	<p>ACADEMIC ADMINISTRATION</p> <ul style="list-style-type: none"> • Promote alliances with the public and private sectors. • Establish research and extension programmes. • Design and implement income generating activities through student-lecturers productive

<ul style="list-style-type: none"> • UG follows a centralized management style, allowing limited responsibility and control at the Faculty level. • The role of the Deans is to identify needs, request expenditures, keep track of allocations and provide accounting evidence for the few budget lines controlled by them. • The management style at UG does not allow for planning. • Funding resources for hiring personnel and operations are limited. • Funding for equipment maintenance and reposition is limited. <p style="text-align: center;">Academic Affairs</p> <ul style="list-style-type: none"> • FAF has developed mission, vision and strategic objectives; it is yet to establish these for the Departments. • The presentation of the curricular grid - course outlines are not standardized. 	<p>projects.</p>
<p style="text-align: center;">TEACHING RESOURCES</p> <p style="text-align: center;">Facilities</p> <ul style="list-style-type: none"> • Air conditioning and better lighting in the classrooms would enhance the learning process. • All laboratories lack adequate biosafety measures (signs, safety protocols, appropriate fume hoods, etc.). • All laboratories infrastructure needs to be rehabilitated. • The library setting is appropriate. • The size of the farm is not adequate to provide for student practice. There is a need to improve plot management by keeping adequate records of land use and establishing appropriate crop rotation patterns. • The biosafety measures are not adequate, in the laboratories safety 	<p style="text-align: center;">TEACHING RESOURCES</p> <p style="text-align: center;">Facilities</p> <ul style="list-style-type: none"> • Rehabilitate and adequate facilities for each purpose (Classrooms, labs, farm, processing plant, etc.) • Establish appropriate biosafety protocols in all processes and facilities. • Introduce elements of well-being (lighting, ventilation furniture, etc. in all facilities • Develop and implement a comprehensive farm development and management plan. <p style="text-align: center;">Equipment</p> <ul style="list-style-type: none"> • Develop and implement an equipment maintenance and

<p>protocols should be visible; waste management protocols are needed; and more fire extinguishing alternatives are also needed.</p> <ul style="list-style-type: none"> • Office space for lecturers is very limited. <p>Equipment</p> <ul style="list-style-type: none"> • Teaching equipment (projectors, screens, models, etc.) need to be replaced and increased to facilitate the teaching-learning process. • Laboratory and farm equipment is old, out-dated, in poor working condition, and in some cases not in sufficient amounts. • Computers and other equipment need to be up-dated. • The Faculty needs vehicles for student transport. • Most student desks and other classroom furniture need to be replaced. • Most of the books available at the library were published more than ten years ago. 	<p>replacement plan; that includes the development of the internal capacity maintenance of equipment.</p> <ul style="list-style-type: none"> • Develop and implement a book replenishment programme.
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3 FACTORS TO IMPROVE

Based on the analysis of the results and conclusions of the studies and on the recommendations made by the Consultants, the Teams were able to identify and prioritise seven factors to improve, these are:

FACTOR 1: Guyana is facing three great challenges: 1) to become capable of demonstrating equity, competitiveness and efficiency in national and foreign markets, 2) to link framers and their products to markets and 3) to respond to the demand with quality products at competitive prices. The Guyanese agricultural, fisheries, forestry and agro-industrial sectors lack preparation and clearly defined policies to guide strategies to address these challenges and achieve sustainable social, economic and environmental development.

PROPOSED OBJECTIVE: Contribute to the restructuring of the agricultural, fisheries, forestry and agro-industrial sectors, through the formation of professionals to lead the internalization of a widened vision of agriculture which focuses on sustainable, competitive and equitable production systems and value chains.

FACTOR 2: The curricula and course outline of the four careers reviewed (Soil Science, Animal Science, Food Science and Diploma in Agriculture) need to improve their technical, humanistic and practical pertinence to the needs of society and the agricultural, fisheries, forestry and agro-industrial sectors.

PROPOSED OBJECTIVE: Review and modify the curricula / course outline to deliver professionals with the demanded competences for the management of production, processing and marketing systems of products; and with the competence to lead technological innovation programmes.

FACTOR 3: The demand for graduates from GSA and FAF can increase as long as the formation process is linked to the course the sectors have taken and they demonstrate competence in the management of the production, transformation and marketing systems.

PROPOSED OBJECTIVE: Improve and maintain the pertinence, relevance and quality of graduates.

FACTOR 4: Both GSA and FAF, show low budgetary allocations for teaching, research-extension and productive activities.

PROPOSED OBJECTIVE: Implement an in-depth cost-benefit analysis of each career and a comparative analysis between careers; and implement a strategy to generate income through research and productive activities.

FACTOR 5: The teaching – learning process at GSA and FAF is threatened and limited by the deteriorated conditions and o/or obsolescence of the infrastructures and equipment.

PROPOSED OBJECTIVE: Identify and design the field and laboratory practices required to deliver the new professional profiles; based on these requirements develop and implement an investment plan to refurbish the facilities and acquire the necessary equipment for teaching, research and productive activities; and develop and implement an equipment maintenance and replacement plan.

FACTOR 6: The GSA and FAF do not implement a staffing and staff development programmes to ensure the academic and technical quality of the teaching staff.

PROPOSED OBJECTIVE: Procure the funding necessary to implement staffing and staff development programmes at GSA and FAF based on selection, contract, induction, evaluation, training and incentives to ensure staff quality.

FACTOR 7: GSA and FAF do not have a mechanism to continuously improve and actualize the curricula to ensure the quality and meeting standards required for accreditation of careers and maintain coherency with the mission, vision and objectives of the careers.

PROPOSED OBJECTIVE: Establish at GSA and FAF a continuous mechanism to evaluate the delivery of curricula, that includes an auto-evaluation process, for the continuous improvement of the careers.

Other factors not selected may be addressed simultaneously with these Plans or when the financial capacity allows.

4 FINAL COMMENTS

The Consultants, with the purpose of summarizing and emphasising important elements, take the opportunity to make the following final comments:

- ✓ **The restructuring of the agricultural, fisheries, forestry and food-processing sectors, to achieve competitiveness, quality products with equity and sustain the natural resource base, requires professionals with new and relevant competences, which include leadership, entrepreneurial, research-extension and practical skills.**
- ✓ **To assure the pertinence and relevance of the five careers reviewed, it is necessary to reorient the strategic institutional framework and educational philosophy at GSA and FAF to have available guiding parameters for future review processes of the academic programmes, course outlines, professional and occupational profiles, programming and instructional methods.**
- ✓ **Having redefined the strategic framework and adjusted the academic programmes, GSA and FAF Management should develop and implement medium term plans, which include staffing and staff development programmes, refurbishing the facilities, equipment replacement, improved student well-being, implementation of**

productive projects, research-extension activities, and a strategy to continuously assure the quality of the academic programmes, to meet national and international accreditation standards for the four careers reviewed.

5 PROJECT PROFILES

TO BE DRAFTED BY GSA AND FAF STAFF

CHAPTER VII GENERAL GUIDELINES FOR THE DEVELOPMENT OF INTERNSHIPS AT THE FACULTY OF AGRICULTURE AND FORESTRY AND AT THE GUYANA SCHOOL OF AGRICULTURE

1 INTRODUCTION

The formation of needed professionals to achieve a sustained agricultural and rural development, demands modifications in the contents of courses and in the present social patterns (values and attitudes). To accomplish these modifications, it is necessary to employ new methods for the development of flexible curriculum, reviewed course contents (based on research), innovative instructional methods, flexible administrative models and renovated linkages between academic community, the public and private sectors.

The Faculty of Agriculture and Forestry at the University of Guyana (FAF) and the Guyana School of Agriculture (GSA), with the technical support of the Inter-American Institute for Cooperation on Agriculture (IICA), implement efforts to review/actualize the curricula of the academic programmes offered in agriculture and forestry. The work plan includes, the development of curricula based on demanded professional competences; development of internship guidelines and the development of a joint research-extension strategy. The proposed curricula review/redesign, pretends to improve the analytical skills of graduates, and adapt the contents of the academic programmes to the needs of the Guyanese society and the agricultural and forestry sector.

Included in the efforts of FAF and GSA is to improve their contribution to the development of innovative agricultural and forestry technology in Guyana, through the redesign of the academic programmes and bring these to international standards and by including elements of entrepreneurial ship.

Internships are recognized as an effective method to improve practical skills of students and to achieve a functional linkage between the academic community and the private sector, with the purpose of forming professionals with the capacities needed to restructure the agricultural sector with a global and futuristic vision to achieve rural, agricultural and environmental sustainable development. This document proposes theoretic fundamentals and general guidelines for the institutionalization of internships as part of formation, research, mobility and academic interchange, strategy for GSA and FAF. It also proposes the steps to follow in this process.

2 CONCEPT OF INTERNSHIP

The objective of internships is to link the students' theoretical and practical practice, to a real working environment, applying knowledge acquired through formal education and developing the interns' abilities to interact technically and socially with the personnel during the duration of the internship.

Internships should be coordinated by an academic tutor, assigned by FAF or GSA, who will guide students in the design of an internship project. The programming of the student's performance in the working environment and the knowledge and abilities to be acquired, should be clearly identified in the internship project. In the work setting, the intern should be under the responsibility of a tutor assigned by the organization, who continuously communicates with the academic tutor, to discuss the progress, performance and obstacles encountered during the interns' stay at the work setting. The tutor should evaluate the interns' performance based on assigned tasks to fulfill the internship objectives.

Internships are often defined as "the exercise of the profession by an intern", referring to activities implemented by students to link to the exercise of their profession, from a social and institutional perspective, understanding the intern a "person that assists and accompanies the tutor in the exercise of a profession, to acquire an integral practical experience." Maintaining at all times, a prominent practical sense and the companionship of tutors that guide, monitor and evaluate the intern's performance. Then, internships are learning strategies based on observation, interviews and practice by interns in real work settings, that allows them to come in contact with tasks and functions of their future profession in a contextualized and direct form, with social and business reality. Others define internship as "the activities implemented by students to complement their formation, through a linkage with a public or private organization, to perform a specific task related to fields of their academic programme, with the objective to demonstrate their vocation and capacities to exercise their future profession."

In this stage of formation, the students will have the opportunity to achieve objectives and put into practice their competence (knowledge, aptitudes, abilities, skills, attitudes and values) in production, administrative, research and/or development processes, in business, social, administrative, economic, technical, cultural, political, legal, industrial, environmental and/or ecological contexts.

The definitions and applications of the concept are diverse and can entail from simple guided tours to public or private organizations to observe and analyse undertakings and dynamics; to those that last an entire academic period. In today's globalised setting, there is a need to form professionals with wide and futuristic vision, with the capacity to analyse and understand the local and international

dynamics and actualities, and to link knowledge to practice, to facilitate problem-solution and responding to the needs of society.

2.1 Dimensions of Internships

Three fundamental dimensions for internships are proposed to FAF's and GSA's consideration as a process to form future professionals, these are the cultural, the academic and the labour/practical dimensions. These dimensions are useful for the formation of agricultural and forestry professionals.

2.1.1 Cultural Dimension

The cultural dimension (collective knowledge), corresponds to the student's opportunity to confront national or international realities / actualities, by understanding people, their customs, diets, transport infrastructure, architecture, norms, values, arts, sports, recreation and other aspects that conform the culture of a society. Social contact implies having a more holistic and open perception of the world, in function of the identification of best practices and actions that guarantee the social and economic success of the Guyanese society.

2.1.2 Academic Dimension

The academic dimension is pedagogically focused on the development of competences (knowledge, abilities, attitudes and values) of interns in their fields of study/action, contrasted with the national and international contexts. The internship should be in consonance with the professional profile of agricultural and forestry professions and contribute to the formation of professionals capable of interacting in diverse settings to solve complex problems for society.

The academic formation through internships corresponds with the identification and analysis of topics of study relevant to the country, which are addressed before implementation, in such a way, that the acquired theoretical knowledge can be confronted by interns, with the guidance of the practice tutor, which entails the design of a project profile to prepare them to take optimal advantage of the internship and to achieve the objectives set.

The internship programme should include space for academic exchange, such that, when interns obtain information from the real work setting, through interviews with experts and direct observations, they can corroborate their research findings through secondary information. Once the information is gathered, it is analysed and interpreted and the results reported. This formation process performed by the interns is a planned academic exercise, which ends with the presentation of a report and may lead to the acquirement of a degree.

2.1.3 Labour or Practical Dimension

Professional formation has a practical dimension; it is a learning strategy that can guarantee developing the capacity to solve social and organizational problems. The internship should include activities to allow experiencing successful enterprising and Guyana's main socio-economic development policies, strategies, programmes and projects, so the interns can identify trends in their profession and have the opportunity of personal and professional development. Getting to know the main technological trends in the country and exercise the profession, will facilitate the interns' insertion into future organizational dynamics and their occupational success.

The labour component of internships, involves the performance of activities inherent to the professional profile of interns and their research capacity, as well as the opportunity to use it, allowing the acquisition of this competence. However, FAF and GSA should strengthen and or develop relations with the private and public sectors, to be in a position to provide internship opportunities to students.

For FAF and GSA purposes, practices should be defined as "the set of theoretical and practical relations linked to knowledge, occupational functions, to research or to entrepreneurship. This dynamic and complex relation is crossed by ethical, political and cultural standards, in which social, institutional and personal logic is involved. It is important to emphasise that internships are academic activities through which tertiary educational institutions may achieve their purpose. Hence, internships have the mission to "contribute to the formation of high quality technologist, technicians and professionals, so they may contribute to the search, research, application and innovation of fields of knowledge in a given profession." The cycle of practice at the educational institution, is constituted as part of the academic programme required to complete the formation at the technological level.

2.2 Internship as Practice

It is considered that from the perspective of this conception, technological formation stems as the equilibrium between theoretical knowledge and the practical formation in abilities/skills that combined with the formation of attitudes and values constitutes the integral formation of professionals, for the benefit of society. Three modalities of practice are then proposed for student internships at FAF or GSA:

2.2.1 Inter-institutional Practice

It is a space where the students perform in diverse settings, the functions and tasks particular to their occupation, profession and work to address the needs of institutions and society. In this practice the students discover social, administrative, and entrepreneurial realities, in search of solutions to problems, through applied

knowledge, acquired in their academic formation, with a high human and professional commitment.

2.2.2 Research Practice

It is a process through which acquired theoretical concepts, new trends, needs, social and institutional expectations interrelate, and problems are identified to propose viable solutions with scientific, technological, and professional fundamentals in a given context. The interns select a topic, subject of study, related to their professional field and which is studied in depth, with the purpose of finding concrete viable solutions, and projecting the results within a given timeframe.

2.2.3 Entrepreneurial Practice

It is the possibility students have, to compile all the needed information to develop an investment project, focused on the initiation of their business venture, to produce a product or provide a service, and developing their own employment opportunity.

Hence, internships, not only orient the students as a cultural, knowledge and experience interchange, it links the interns to research-action processes, where a national or international topic is studied, to characterise and establish its relations and projections at the national, regional and local contexts. This lively experience, expands the interns' vision of their country and profession, passing from being a local context to an international one; allowing, the interns to analyse trends in their profession, and later, facilitating their insertion to a work environment, as their experience transforms into added value, providing advantages over other people, when searching for a job or initiating their own business venture.

2.3 The Process

The proposed formation process through internships has three distinct phases described below, through which the linkage between the FAF and GSA academic community with national reality/actuality, is achieved through the participating interns. Intern registration should be done through FAF or GSA, which assign an academic tutor to assist the student in designing an internship work plan, including the selection of a topic to be studied.

2.3.1 Before the Internship

To fulfil the graduation requirement, students must develop a cycle of practices, in the different modalities proposed by FAF or GSA. When students register for internship, they are assigned a tutor who accompanies them through the academic period. The students review pertinent topics to their personal and professional formation, and relevant to national agricultural priorities and society. Once the topic

is selected, the students with the assistance of the tutors develop an internship project profile and set specific learning objectives. The project profile should include an analysis of background information and conceptual framework to allow students, through secondary information, to widen and deepen their perspective (knowledge) of the selected topic, to know and understand involved variables and the relations with the country's present of future reality/actuality. The students, with defined topics and clear theoretic fundamentals, can proceed to develop a project proposal including materials, methods, resources needed for the field work.

This project document should include the following contents:

- Title
- Topic
- Problem statement (need or opportunity, related to the selected topic)
- Purpose of the study (background)
- Justification
- General and specific objectives
- Expected products
- Scope
- Methodology (resources, materials, space and time frameworks, and methods)

2.3.2 During the Internship

During the internship, interns should compile primary information, following the proposed methodology. Direct observation is to be considered as the most appropriate and expedite technique for interns to identify the country's actuality. Similarly, in other academic activities and guided visits to private enterprises and public organisations, included in the agenda, interns will find judgement criteria to form their personal idea of the problem under study. Interviews with experts are also a viable alternative to identify trends in the field of study related to the selected topic and solutions. The interns will then have the capacity to propose possible solutions.

2.3.3 After the Internship

Once the field work phase of the internship is over, the interns must systematize their experience and the compiled information to develop a project report, in which evidence is provide of the achievement of the learning and internship objectives. This exercise ends with the written and oral socialization of the report to an evaluation committee, where the project objectives and results are confronted, and inferences, conclusions and recommendations are drafted.

2.4 Internship Evaluation

Evaluation, as an academic tool, allows analysing and providing feedback related to the interns' formation process, through progress reports received by the tutors during the duration of the internship, who monitor and guide the project. Similarly, at the end of the internship, the socialization of the report by the interns, allows a final evaluation of the process and achievements. Therefore, the internship is evaluated integrally, in other words, the interns' performance is continuously evaluated by the tutor and through the report socialization- process, with the participation of an independent jury the final results and achievements are evaluated, through the interns' capacity to render their experiences.

Among the principal evaluation criteria suggested are:

- Quality and scope of the proposal
- Fulfilment of the learning and internship objectives
- Demonstrated competences during the internship
- Quality and scope of the written report
- Quality of the presentation and socialization of the report
- Self-assurance and coherence of interns during the presentation
- Clarity and quality of responses to jurors questions

In conclusion, the evaluation process allows verifying the achievement of the internship objectives, allows the socialization of results, facilitates a self-evaluation by interns, in their formation process, and allows the evaluation by tutors, peers and faculty staff, as well as the evaluation of their personal and professional transformation as evidenced during the socialization process.

2.5 Generalities of Rules and Regulations

The rules and regulations should set the basic concepts for the participation of interns, clearly defining the exercise of the internship, emphasising its importance and relevance, within the professional formation process, its social importance and relevance, and its interdisciplinary linkage transcendence.

3 INSTITUTIONALIZING INTERNSHIPS

The following steps are suggested for developing internship opportunities for FAF and GSA students:

3.1 Development of an Institutional Framework

This step should begin analysing previous institutional experience with internships and considering the proposed guidelines and concepts contained in this document.

The resulting institutional framework should at least include the following components:

- Philosophy and concepts for internships
- Mission, vision and objectives of internships
- Definition of the scope and depth of internships
- Definition of academic and administrative processes to facilitate internship development
- Curriculum considerations:
 - Start (it is suggested for the internship to start when the student has completed 80% of the courses in the academic programme)
 - Duration (one academic period is suggested).
 - Credit value (8 credits hours are suggested).
 - Consider it as a graduation requirement.
 - It may be considered as an alternative to thesis work.
- Definition of rules and regulations. It is suggested that these should include:
 - Concepts of internship
 - Social importance
 - Interdisciplinary perspective
 - Legal obligations
 - Contractual framework
- Definition of a student orientation mechanism
- Design of a registration process
- Approval of the framework

3.2 Establishing Formal Relations with Partners

This step requires careful reflexion from FAF and GSA officials and laying out the strategy to follow in the identification, selection and induction of public and private organizations to the internship programme. The following steps are suggested:

- Identification of potential partners
- Selection of partners based on capacity and compatibility with institutional mission, vision and objectives.
- Sharing with selected partners the institutional internship programme
- Definition of contractual and legal implications
- Formalizing the relations following institutional regulations

4 FINAL CONSIDERATIONS

Both internal and external consultations confirm the need to deliver competent professionals with the capacity to link knowledge to practice, in other words, innovative professionals. Consultations also indicate the need for professionals to be knowledgeable of the country's agricultural realities/actualities and future

potentials and paradigms. Professionals are then expected to contribute to solution of problems, to confront paradigms and to lead the achievement of sustainable agricultural and rural development. Internship provides an agile, effective, low-cost and sustainable opportunity to meet these expectations. As added value, both the academic institutions and their partners benefit from the yields of a close working relation. Therefore, the Faculty of Agriculture and Forestry and the Guyana School of Agriculture are encouraged to adopt and internalize internships into their academic programmes.

CHAPTER VIII GUIDELINES FOR DEVELOPING AN EDUCATIONAL SCIENTIFIC – TECHNICAL INTEGRATED SYSTEM IN GUYANA

1 INTRODUCTION

Competitiveness has been forever present in economic activities, evolves at a pace and speed set by policies and needs of countries. At present, in tune with the globalization process, competitiveness has gained relevance in view of international competition, and because it is not only necessary to actively participate in internal markets, but also to synchronize with international economic policies. Hence, promoting competitiveness at the country and corporate levels is meaningful within the present global economic order. What does not have meaning, is the lack of recognition of agriculture's role in global change and sustainable development.

Although agriculture has a significant contribution to the gross domestic product (GDP) and to the generation of employment opportunities, the agricultural sector **(in this document it includes crops, livestock, fisheries, forestry and processing)** have been subject to contradictory policies, some oriented to reform the sector, rather than to its development. This is due largely to governments' efforts to achieve political, social and economic objectives, through interventions such as price control, consumer protection schemes, foreign exchange earnings, conservation and inflation control, and partly to the urban bias of most macro-policies.

In Guyana sugar and rice are the most important primary agricultural products, as they have been since the nineteenth century. Sugar is produced primarily for export whereas most rice is consumed domestically. Sugar production generates the highest revenue in the primary industry, ranging from 28 to 32% of the total annual GDP. Other important crops include, bananas, plantains, coconuts, peanuts, coffee, cocoa, citrus fruits, pepper, and pumpkin and livestock commodities including beef, pork, poultry, dairy products, fish, and notably shrimp. Small amounts of vegetables, vegetable oil and tobacco are also produced. Many of these products, including rice, are of extreme importance to national food security. Guyana has achieved a high level of food security and has the capability to export food crops.

With the exception of rice and sugarcane production, agriculture is seen as a subsistence venture. Agriculture is still based on traditional practices, rather than on new technological developments, for example market, policy, knowledge and technology. There is a general perception that Guyanese agriculture is technologically lags behind that of neighbouring countries. Farmers are not business-minded and therefore, agriculture is not seen as a business. This is seen

to negatively affect equity building (capital accumulation) in the sector, hence, there is a high dependency on financial assistance and credit; and the level of technology used and job opportunities for agricultural professionals in the private sector.

Agriculture is a small-scale operation, with the exception of rice and sugar production, practised by individual farmers with limited education and training, and if organized, these organizations are weak. This is seen as a hindrance to increase the level of technology in agriculture, to assure the reliability of product supply, to the delivery of agricultural extension services, to the provision of credit services and to the chain of input supply. It is also seen as a constraint to move from primary production to agro-industrial agriculture. A related issue is the perception that most of the academic population and agricultural professionals are equipped with out-dated knowledge, out-dated technological skills, lack practical skills and are disconnected from the realities and policies of the sector.

A generalized opinion is that Guyanese agriculture in the past has been more oriented to primary production than to market; in the future agriculture is seen to be market-driven, being more technology-driven, professional and having higher standards of production and processing will be increased. Agriculture will be more diversified and farmers will be better trained and organized. In this respect, agriculture is shifting to more crop production in protected environments, livestock, fisheries/aquaculture, and forestry production for exports. It is also envisioned that agriculture will be geared to adding value to products for the export market; emphasizing plant protection and food safety in product transformation and processing, to meet national and international standards; and farm certification will be required. Agriculture is moving towards the production of non-traditional crops and move from small-scale to large scale and intensive production systems. However, it is recognized that this sector transformation, requires adjustments to policies and legislations.

It is recognized that recently the Government has launched a series of modern legislative measures (livestock health, seed production, food safety) to meet international standards, participants also emphasized the need to modernize other sectorial legislation and the development of the capacity in Government institutions to exercise their normative, supervisory and statutory role. Areas noticed by participants include land use, water use, food quality and safety, marketing of food products, use of biodiversity, agrochemical use, environmental conservation and career accreditation and professional certification.

The shift to the envisioned agriculture needs to be supported by improved policies that ensure equal access to information, technology and services; the efficacy of

agricultural policies varies. These policies need to be drafted through a more participative mechanism and then be effectively diffused, and furthermore, farmers and professionals must be able to comprehend them. The agricultural loan requirements have to be reviewed and eased to make loans more accessible. A policy to establish agriculture insurance schemes is a recognized need. As is, a more effective land uses policy and regulations for the use and conservation of the country's natural resource base. Product pricing policy has to be more equitable and less consumer-biased. Access to information and technology also has to be more universal by most farmers.

The formation of needed professionals to achieve a sustained agricultural and rural development, demands modifications in the contents of courses and in the present social patterns (values and attitudes). To accomplish these modifications, it is necessary to employ new methods for the development of flexible curriculum, reviewed course contents (based on research), innovative instructional methods, flexible administrative models and renovated linkages between academic community, the public and private sectors.

The Faculty of Agriculture and Forestry at the University of Guyana (FAF) and the Guyana School of Agriculture (GSA), with the technical support of the Inter-American Institute for Cooperation on Agriculture (IICA), implement efforts to review/actualize the curricula of the academic programmes offered in agriculture and forestry. The work plan includes, the development of curricula based on demanded professional competences; development of internship guidelines and the development of a joint research-extension strategy. The proposed curricula review/redesign, pretends to improve the analytical skills of graduates, and adapt the contents of the academic programmes to the needs of the Guyanese society and the agricultural and forestry sector.

Included in the efforts of FAF and GSA is to improve their contribution to the development of innovative agricultural and forestry technology in Guyana, through the redesign of the academic programmes and bring these to international standards and by including elements of entrepreneurial ship.

Internships are recognized as an effective method to improve practical skills of students and to achieve a functional linkage between the academic community and the private sector, with the purpose of forming professionals with the capacities needed to restructure the agricultural sector with a global and futuristic vision to achieve rural, agricultural and environmental sustainable development. This document proposes theoretic fundamentals and general guidelines for the institutionalization of internships as part of formation, research, mobility and academic interchange, strategy for GSA and FAF. It also proposes the steps to follow in this process.

2 PRESENT SITUATIONS

2.1 The Challenge: Sustainable Agricultural and Rural Development

There are no magical formulas to improve the Agricultural Sector. However, it may be safely assumed that in Guyana, there is a need to redefine the roles of the private, public and the professional sectors. Hence, it is necessary to eliminate anti-agriculture biases from national and industrial policies; improve infrastructure such as roads, energy supply, irrigation and communication; improve credit, extension and supply services; and forge new alliances amongst all stakeholders.

These interventions can contribute to the modernization of agriculture, fisheries and forestry. However, it is the research component that has the greatest contribution potential to increase sectorial productivity, efficiency and competitiveness. It is accepted, that in the past fifty years, new technology (improved varieties, quality seed, fertilizers, integrated pest and disease management, cropping system approaches and best production and manufacturing practises), has been the most reliable source, to increase productivity and sustainability of agriculture. Therefore, in Guyana, it is necessary to increase investment in agricultural research, to be able to:

- Increase productivity, competitiveness, and sustainability,
- Generate technology to conserve the environment and mitigate the impact of climate change,
- Take advantage of opportunities available through trade agreements,
- Facilitate the flow of technology towards farmers,
- Strengthen gender roles in agriculture, and
- Sustain national food and nutrition security.

2.2 Articulation of the Integrated GSA- FAF R&E System

It is worth emphasizing again, that there are no magical formulas for achieving sustainable agricultural and rural development and conserving the environment. Besides, confronting the before mentioned challenges, entails certain conflicts amongst different social components. But two things are real:

- Opening the economy and the globalization of markets are necessary to significantly develop agriculture, but are not exclusive; continuous growth cannot be sustained, without investing in adequate rural infrastructure, credit and transfer of technology.
- Investment in research to develop new technology has high returns.

For technology change to contribute to the reform of the Sector, make it more competitive and remove obstacles to development, Government should encourage:

- Stakeholder participation in planning, implementing, monitoring and evaluating all R&E activities.
- Taking advantage of all the capacities of national, regional and international research institutions and participation in sub-regional and regional scientific-technical networks.
- Strengthening of national R&E capacities, by improving the research-staff competences, infrastructure and equipment; and forging a functional working mechanism amongst R&E staff.

To achieve the advancement of technology development in Guyana, it will also be necessary to confront three major constraints. The first is a consequence of the limited efforts to motivate the private sector to accept responsibilities in the generation and transfer of technology, as demanded by the up-coming economic model. At present, there are unattended technological vacuums.

The second is that agricultural activities are isolated from industrial processing; hence, R&E activities generally end at the farm gate and disregarding the close relations that exist between production, processing and supply. Resulting in a distortion in the perception of the Sector's contributions to the GDP, and therefore, in the priority level given to it in the national development model. Hence, the stakeholders in these chains, including those in primary production, should participate in the planning, implementation, monitoring and evaluation of R&E activities.

The third constraint is the scarce financial resources available for public R&E activities, with limited possibilities of appealing for Government funds (Ministry of Agriculture, Ministry of Education, or the Ministry of Finance), already limited by the restrictions on public expenditures. An alternative to address this constraint is to forge a horizontal collaboration mechanism, at the national, sub-regional and international levels, to share objectives, responsibilities, financial, human, infrastructure and equipment resources between GSA and FAF in preparation to do the same with NAREI and other stakeholders in the country.

Therefore, in response to the national development strategy and considering the complementary roles played by GSA and FAF in this strategy it is rational to propose the scientific-technical integration of GSA and FAF and a system to implement the integration. The purpose of the integration is surpassing the constraints hindering R&E to effectively contribute to increasing agricultural

competitiveness and sustainability. Sharing the guidelines for the development of the integrated system is the objective of this document.

2.3 Agricultural R&E in Guyana

R&E have intrinsic limitations that must also be surpassed. One has to do with the limited institutional allocation of resources to R&E activities, which means fewer funds for operations and restrictions in hiring or maintaining qualified personnel, hence, diminishing the quality of the technology generated, and or limiting its geographical pertinence. The second, which aggravates the first, is the pressure placed on researchers and research institutions to disperse efforts, instead of its concentration. This pressure to disperse occurs in two scopes, the first is the large number of topics, subjects and geographic regions that demand the attention of R&E; and perhaps more important, is the duplication of R&E activities that occur in the absence of horizontal integration and coordination.

It is believed that the country's agricultural technology inventory is limited, it lacks pertinence and it is not readily accessible, on an equal basis, to all users. The impact of this, and other related limitations, has been the distortion of the real potential of agriculture and research to contribute to sustainable human development and to the conservation of natural resources that emerge as a priority and have a global context.

As a result, the sector has weakened, private and public investments in agriculture have decreased or remained stagnated, prices of products are erratic and have a downward trend for farmers but an upward trend for consumers; the prices of production supplies have increased; credit is scarce and not accessible to all; and competitiveness is limited. To complicate matters, Guyana is on course to open more its economy, diversifying agricultural production, which then implies that agricultural production needs to be supported by technology and linked to the processing and transformation sectors, to be able to compete in internal and international markets. These actualities pose serious challenges to R&E.

2.3.1 Capacity of the National Research System

Public research institutions (NAREI, GRDB, and GLDB, among other) and GuySuCo, operate in isolation, setting individual research agendas and having limited integration mechanisms. The GSA and FAF do not have a R&E programme; hence, research is done without planning and strategic objectives. Therefore, in a strict sense, there is no national R&E system. NAREI is the main functioning component of R&E in Guyana, it has a defined research agenda oriented at solving problems

related to MOA programmes; but the agenda is developed with limited stakeholder participation.

Constraints faced by Guyana's R&E institutions have limited budget, number and experienced staff and weaknesses in their management model and organizational structure, which generally has a vertical dominance and responds either to geographic demand, scientific disciplines or products; and the research strategy lacks a production systems and value chain approach. This present situation calls on reflexion to conceptualize the new R&E system that considers the new technological, social, economic and environmental paradigms Guyana's agriculture is to face in the short, medium and long term; to recognize the risks, the complexity of sustainability and competitiveness; and rescue traditional knowledge. This entails the following challenges:

- Form competent human resources.
- Maintain a continuous training programme.
- Ensure the generational relay.
- Improve working conditions (salaries, incentives, etc.).
- Ensure institutional sustainability and strengthening.
- Enhance institutional capacity to compete for funding.
- Stimulate the private sector to participate in establishing and financing the R&E agenda.
- Link research to extension, plant and animal health, quality control, and other agricultural systems.
- Develop a national research system.

There is much information and technology in institutional archives, but there are limited mechanisms to diffuse it. Limitations faced by technology transfer are not less complex than those of research. The existing wide asymmetry of users and the limited number of functional farmers' associations are a hindrance to the functionality of any extension model. The limited institutional and human resource capacity; the limited mobility of extension staff; the absence of mechanism to keep extension staff up-dated; the lack of correspondence of the extension model with user segmentation and characteristics; and the deficient linkage mechanisms between R&E activities, are some of the persisting limitations. As a result, extension staff and farmers are not kept informed and the access to information and technology is not equitable; and GSA and FAF are not members of the national R&E system. This explained partly explained by the concept of extension, university officials have of extension, which is generic, and therefore, does not support agricultural extension activities.

2.3.2 GSA- FAF Research and Extension Capacities

The level of organization and functionality of R&E activities is limited. The absence of a research or extension programmes is evident as a regular financing for these activities is not part of the regular budget, nor are these part of academic staff responsibilities. FAF students implement research projects as part of their graduation requirements, but seldom relate or form part of an overall research objective or agenda. GSA students, who as graduates are called to perform research assistant roles, are not exposed to research activities during their formation. Staff and students at GSA or FAF seldom implement extension activities. Hence, they graduate without much competence in both functions. Furthermore, there is no evidence of stakeholder participation in setting the student research objectives; hence doubts emerge of the pertinence of this research to needs and main problems faced by the agricultural sector. Generally this research is circumscribed to production problems and does not address product transformation or extension issues.

Linkage mechanisms between FAF, GSA and public or private research or extension institutions are no evident, sporadic joint ventures do occur. Nor the FAF or GSA have full or part time research or extension staff and the already overworked academic staff, have reduced time to implement a regular research or extension programme; and the limited experience of staff in R&E, is also recognized.

2.3.3 Guyana's Needs

The R&E activities needed in Guyana require the contribution of many disciplines, specializations, information and resources. Often, agricultural problems transcend the institutional or national capacity. Hence, it is valid to recognize that may be necessary to forge national or even international alliances to achieve the sustained development of the agricultural sector.

This situation then requires taking advantage of all stakeholders' capacities to generate and transfer agricultural, forestry and processing technology in the country. Therefore, it is justified to promote a GSA-FAF integrated scientific-technological system, its horizontal integration to the national agricultural R&E system and to sub-regional systems (CARDI and PROCICARIBE); forge alliances with international and regional research institutions such as CIMMYT, CIAT, CATIE and CIP, IICA, FAO etc.; and with non-government organizations.

3 GSA-FAF SCIENTIFIC-TECHNOLOGICAL INTEGRATION

A curricular review is being implemented by GSA and FAF is to ensure relevance and pertinence of professional profiles and curricula of agricultural and forestry

degrees to the country's needs. This review has the purpose to adapt the professional profile to the demands of the private and public sectors; improve the analytical, innovative and practical skills of graduates; and establish a solid linkage between the academic population and the private sector. One of the specific objectives of the review is to improve or increase the R&E capacities of graduates, establishing a functional mechanism to integrate GSA and FAF to R&E activities. Meeting this objective will contribute to the implementation of solutions to problems and technological actualization of the sectors.

To accomplish this objective, a two-phase strategy is proposed. In the first phase, an inter-institutional team (IIT) is established and charged with the responsibility to draft the guidelines for the integration; propose the composition, operation mode and a financial strategy for the system. The second phase begins with the first disbursement of funds and with the constitution of the GSA-FAF Educational-Scientific-Technological Integrated System (ESTIS), which will implement R&E projects in agriculture, fisheries, forestry and processing.

3.1 Justification

The potential benefits for Guyana from establishing such a system, are promising, not only in institutional strengthening, but mainly, in achieving high standards of sustainability and competitiveness and a favourable commercial balance. Other expected benefits include:

- 1.** Increased socio-economic development of rural communities, especially those of limited resources and poverty-stricken.
- 2.** Improved management of the natural resource base to achieve a sustainable agricultural and rural development.
- 3.** Increased levels of sustainable nutrition-food security, based on increased productivity and access to food.

3.2 Mission, Vision and Objectives of ESTIS

As guiding elements for the IIT, ESTIS is proposed to be committed to sustainable rural, agricultural, fisheries, forestry and processing development willing to exchange knowledge and experience, and forge alliances with farmers, agri-business, public institutions, community organizations, scientists, to lead the transformation of the sectors; with the following mission, vision, values and strategic objectives:

3.2.1 Mission

Contribute to the generation of wealth, to the development of sustained rural, agricultural, fisheries and forestry development, through innovations that promote the efficiency in the agricultural value chain and in the use and conservation of natural resources and the environment.

3.2.2 Vision

To be a R&E system recognized at the national and sub-regional level for the technological contributions made.

3.2.3 Values

Responsibility

Assume all the implications of our activities, committed to people, with the environment, and with the end results.

Equity

Recognize the rights of all people to access knowledge, services, technology and resources.

Bioethics

Recognize the value of human capital, of the environment, of natural resources, and of agriculture and forestry.

Cooperation

Forge alliances with institutions and individuals with compatible objectives and values to ours.

Innovation

Generate and diffuse knowledge and technology for products and processes and for markets, which contribute to environmental conservation and to the rational use of natural resources.

Quality

Quality committed in all our endeavours.

3.2.4 General Objective

Promote scientific-technological integration among all stakeholders to generate and transfer knowledge and technology, ensuring integration and complementation to achieve productivity and competitiveness and sustainability in agriculture, forestry and processing; and consequently contribute to enhance the quality of life of farmers and forest dwellers. The goal is then to achieve sustainable rural and agricultural development.

3.3 Expected Results

The expected results from ESTIS are:

1. R&E (R&E) systems operating efficiently at GSA and FAF.
2. Increased number and quality of technological alternatives transferred as a result of:
 - A gradual adoption by GSA and FAF of a R&E approach, in which the chain of production, processing and marketing of agricultural and forestry products to supply the national and global demands, constitutes the object of all activities.
 - Effective participation of all chain stakeholders (farmers, foresters, public and private R&E institutions, processors, and merchants) in planning, implementing, monitoring, evaluating and financing R&E activities.
 - Improved capacity to identify, generate, import, and adapt technology, through an improved access and use of information from universities, sub-regional and international research centres and regional technical networks.
 - Assigning an economic value to generated or acquired technology so as to appropriately remunerate the developers.
 - Effective identification, design, development and implementation of national projects, based on a proficient distribution of responsibility among all participating stakeholders.

To achieve the expected products, the following programmes should be established:

1. Research and Extension.
2. Policy Development and Institutional Building.
3. Information, Communication and Documentation.
4. Staff Development and Professional Exchange.

The expected results by Programme are:

.3.1 Research and Extension

In the past, new technologies (fertilizers, hybrids, new animal breeds, quality seed, integrated pest management, etc.) have played a leading role in increasing the productivity in agriculture and forestry. Irrespective of this contribution, investment in agricultural R&E in Latin-America and the Caribbean (LAC) has decreased in comparison with other regions in the world, in absolute value and in proportion of the agricultural-forestry GDP. Given the increase in poverty levels, particularly in rural areas and increasing environmental and natural resource degradation, the expected programme results are:

1. Increased sectorial productivity, competitiveness and sustainability.
2. Increased farmers' and forest dwellers income.
3. Increased availability of environmental-friendly technology.
4. Increased flow of technology at all levels.
5. Strengthened role of women in agriculture, agro-processing and forestry.
6. Increased use of market opportunities through trade agreements.
7. Increased sustainability of nutrition-food security.

3.3.2 Policies and Institutional Building

The main expected results are:

1. Up-dated characterization of the present technology in use at the national and sub-regional level.
2. National and sub-regional R&E policies harmonized; for example patents, trade-marks, genetic resources exchange and research staff interchanges.
3. System evaluation mechanism in operation.
4. R&E programmes strengthened at GSA and FAF.
5. The integration mechanism operating between ESTIS and the private sector for the incubation of technology development enterprises for production, processing, supplies and equipment.

3.3.3 Information, Documentation and Communication

The expected products are:

1. Improved information technology operating and increased information management capacity at GSA, FAF and associate stakeholders.
2. Continuously up-dated research information available and document deposits operating at GSA and FAF.
3. National agricultural, agro-processing and forestry information and documentation deposit operating.

4. An annually up-dated directory of national and sub-regional research, research and extension staff up-dated annually.
5. A technology consultation system operating for famers, agro-processors and foresters.

3.3.4 Staff Development and Interchange

The expected results are:

1. Actualized characterization of national and sub-regional training capacity.
2. Actualized inventory of national and sub-regional experts in R&E priority areas.
3. Formal and informal training programmes operating for experts in priority R&E topics. It may include post-graduate level training operating as a consortium.
4. National and sub-regional staff interchange mechanism operating.
5. R&E leadership formation programme operating with support from IICA, FAO, CARDI, ECLAC, UNDP, and etc.

3.4 Strategy

The strategy is founded on the strengthening of GSA and FAF to implement R&E capacities, which requires:

1. Promote among ETIS associates, linkages at intra and inter institutional levels to implement joint R&E programmes.
2. Articulate at the national level a functional R&E system, with GSA and FAF participation.
3. Develop a participative mechanism (lecturers/researchers, extension staff, students and other stakeholders), for the definition of the national R&E agenda and an effective funding strategy.

With the information on hand and that which the IIT can provide, the guiding elements are in place for designing ESTIS. It is proposed that the strategy at least considers the following elements:

1. Structure, organization and operation of ESTIS.
2. Mission, vision, values and objectives.
3. Resource inventory (staff, facilities, and equipment).
4. Up-dated technology inventory.
5. Strengthening of stakeholders.
6. A mechanism for developing the R&E and funding the agenda.

7. Internal and external mechanisms for linking R&E.
8. A mechanism for integrating ESTIS to the national and sub-regional R&E systems.

To contribute stakeholder's institutional strengthening, GSA and FAF must complement this joint effort with information and resources. With the present organization and structure of R&E, the institutional scale, the available human resources and existing facilities, it is difficult to achieve the appropriate level of efficiency required to effectively meet the demand for technology from farmers, processors and consumers, without incurring on high costs and duplicating efforts. Generally, production problems are common to several geographical regions, and so are their solutions.

At the beginning, ESTIS should concentrate efforts in identifying or redefining short, medium and long-term priorities for GSA and FAF; to strengthen the national research system, and to attract and integrate the private sector and NGOs. Research should be conducted with a participatory approach and with a production system and value chain perspectives. ESTIS should respond to the demand of society and markets, at national, sub-regional or global levels.

Challenges to agricultural, forestry processing research are complex and demanding, ESTIS should support the intensification of production in high potential areas, but with higher environmental consciousness. Simultaneously, more R&E will be necessary in less productive areas, which are generally those of poverty concentration. This focus is founded on the socio-economic demand from the rural population and to identifying priorities for R&E. The goal is to increase income and food security. Until this situation changes, ESTIS should implement research to develop sustainable low-cost technology for nutrition-food production and labour and income-generating production systems; suitable for small and large scale production and with benefits for consumers.

These considerations, which search for efficiency, imply that ESTIS should function as an open R&E system. This should be manifested through a close collaboration effort between ESTIS and sub-regional and international research centres and a strengthened relation with the private sector. Accepting this, then ESTIS should work in the following context:

1. Increase farmers', foresters' and processors' productivity and income.
2. Environment and Natural Resource Conservation
3. Protect the environment and natural resources.
4. Utilize and conserve the genetic resource base and protect biodiversity.
5. Improve R&E policies.

6. Strengthen GSA's and FAF's institutional capacities.

One of the main objectives of ESTIS is to assist in the strengthening of associated institutions, through formal training of staff, building the R&E related administrative and management capacities and developing the capacities to manage and use information for R&E purposes. To achieve this objective, the strategy calls for articulating the participation of GSA and FAF with activities implemented by sub-regional and international research centres. To achieve the second objective, it is suggested for GSA and FAF to share responsibilities, according to capacities, to solve priority R&E problems. The strategy tries to complement the benefits of reciprocal horizontal cooperation, with those of the national scientific-technological integration achieved.

To achieve the expected products in each objective, an efficient use of available information, staff, facilities and financial resources will be necessary. The strategy proposes that activities be implemented in two phases:

3.4.1 Phase 1: Constitution of ESTIS.

The institutions that can contribute to the solution of identified problems and to promote a sustainable agriculture, forestry and rural development are diverse and include the Ministry of Agriculture and ascribed institutions, the Ministry of the Environment, the Ministry of Education, GSA, FAF, NGOs, GuySuCo, farmers associations, industrial associations, banks, cooperatives, processing enterprises, sub-regional and international institutions, etc. The functions and responsibilities of these institutions are as diverse, and it is accepted, that separately, these stakeholders cannot provide the technical experience, the contact with communities, the incentives and sanctions, the policies and the human and financial resources needed to organize ESTIS. This suggests then, that it is necessary to strengthen the linkages between these institutions and the coordinating mechanism between GSA and FAF, that is, ESTIS.

It is necessary to consider, that each linkage has a cost in communications, coordination, and cooperation agreements. To minimize these costs, the linkages should be based on clear definition of objectives, roles, and responsibilities. To develop this Phase, which begins once the proposal is approved, GSA and FAF representatives that will join the IIT.

To develop the R&E Programme, the ITT will identify the unsatisfied technological demand, describe the technology to be developed and identify the existing national institutional capacity to meet the demand. With this information and considering the existing capacities, the ITT will elaborate the R&E programme.

3.4.2 Phase 2: Implementation of ESTIS

The second Phase begins when ESTIS is constituted and with the first financial disbursement of the cooperation project. This Phase will be developed through the implementation of projects, which would be part of one of seven programmes. The projects can be implemented at the national or sub-regional level.

3.5 Proposed Organizational Structure

ESTIS' organizational structure should be light and responsive and the power of decision should rest within the demand (growers, foresters, processors). ESTIS is proposed with a matrix design (Figures 2.1 and 2.2), based on technical functions and hierarchical administrative and coordination lines. Three levels of hierarchy are suggested for the macro-structure: the deliberative (Board of Governors) presided by the Dean from FAF or the CEO from GSA, with four members, representing producers and processors, and a Director, as secretary, with no vote, and supported by a gender expert as advisor. The executive level is proposed to have Technical Council supported by an Executive Director, elected from the private sector; and the operational level with one Coordinator and one researcher and one extension staff, from GSA and FAF.

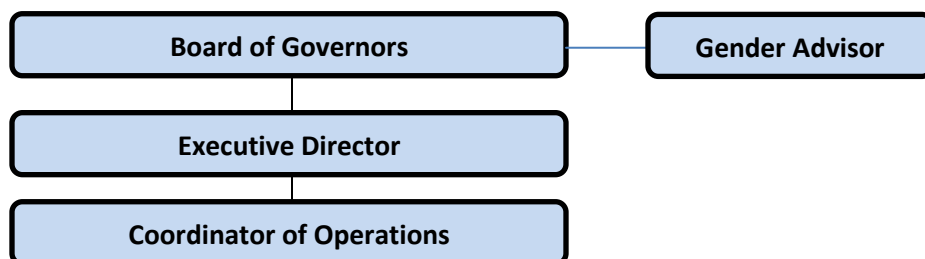


Figure 2.1 ESTIS Macro-structure

The organizational micro-structure proposed (Figure 2.2) for ESTIS is also light and responsive. To ensure an effective linkage with users, it is proposed that the Executive Director be elected from the private sector. To ensure a functional integration between research and extension staff, three levels of coordination are proposed.

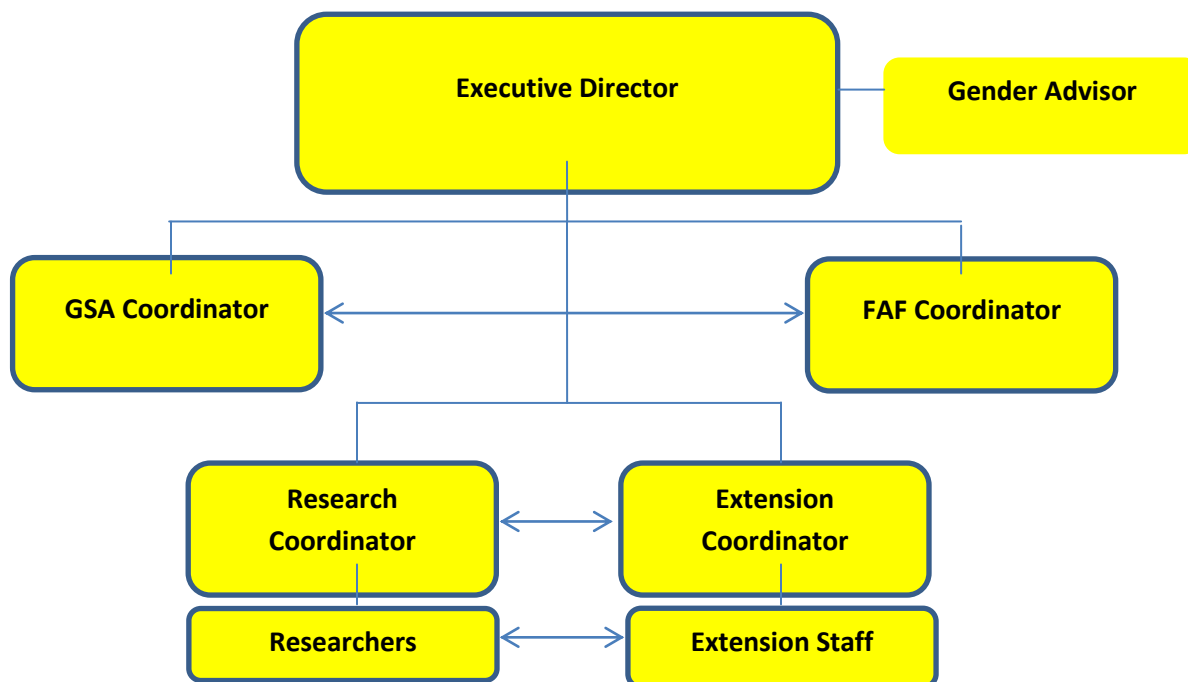


Figure 2.2 Micro-structure

3.6 Operation of ESTIS

3.6.1 Beneficiaries

Direct beneficiaries of the integration include the sectorial policies and GSA, FAF and their students. Indirect beneficiaries are farmers, forest dwellers, agro-industrial processors, who will have access to a larger and more appropriate technology inventory; consumers, who will have access to more and higher quality products at affordable prices; and the environment and natural resources, as technologies would be cleaner and environment-friendly.

3.6.2 Guidelines and Basic Elements

Considering the country's needs, the following guidelines and basic elements are suggested for ESTIS:

1. ESTIS' organizational structure should have minimum bureaucracy with agile and flexible procedures and actions (***Minimum Bureaucracy and Professional Competence***).
2. ESTIS will not undertake tasks that can be performed individually by GSA or FAF. ESTIS will add to on-going initiatives, working on shared problems and developing technologies that are easily transferred to other regions and

countries within the Sub-region (**Address Problems that Share a Common Solution and that can be widely Transferable**).

3. Given that ESTIS will possess innovative R&E staff and that there is a large research capacity outside Guyana, ESTIS will operate with an open model, to allow the appropriation of existing results and the use of external R&E capacity, in and out of the Country (**Open Model**).
4. Recognizing that there are differentiated comparative advantages between GSA and FAF, ESTIS will establish a division of labour, such that it allows taking advantage of these differences. To achieve this, in a joint decision, GSA and FAF will lead a specific priority R&E programmes (**Taking Benefit of Comparative Advantages and Expertise**).
5. Considering the existence of institutional asymmetries between GSA and FAF, an institutional strengthening component will be implemented to strengthen the institutional R&E teams' capacities (**Minimize Asymmetries**).
6. Given the priority to add value to agricultural and forestry products, diversify consumption and meet the quality standards demanded by potential foreign consumers, ESTIS will install an agro-industrial component, with a value-chain approach; and integrated research projects conducted by multi-discipline teams (**Production Systems and Value Chain Approaches**).
7. ESTIS will work not only generate pre-competitive technologies, otherwise known as public goods (such as genetic resources, soils and water conservation, gene banks, among other), but also to generate finished technologies (private goods), which can rapidly enter the production-industrial chain, with characteristics that allow obtaining property rights and increase the competitiveness of products (**Public and Private Goods**).
8. ESTIS will promote the participation of the public and private sectors in the commercial development of innovative technology (**Joint Entrepreneurial Ventures**).
9. ESTIS will complement and support cooperative initiatives in progress in the sub-region, principally in specialized networks that share objectives and values (**Complementarity and Cooperation**).

3.6.3 ESTIS Programmes

To achieve the expected products, ESTIS will develop four different, but complementary programmes to implement projects and activities. The suggested programmes include:

Research and Extension (R&E)

The purpose of the R&E Programme is to introduce, generate, adapt, validate and transfer appropriate technology to increase productivity and competitiveness of

prioritized products, compatible with the conservation of the environment and natural resources. This Programme will focus on developing clean technologies (best practises) to contribute to the well-being of the rural and urban populations.

The strategy calls for GSA and FAF to share responsibilities with public and private institutions, based on institutional capacities, to introduce, generate, adapt, validate and transfer technologies appropriate for the needs of producers, foresters and processors. Driven by the demand, the R&E projects may be developed through consortiums between stakeholders.

Project coordination will be an important temporary element, provided by the institution that has the competitive advantage in the topic of research. Programming, execution, monitoring and evaluation of the R&E projects, should be carried out in such a way that the compatibility and use of approaches, such as sustainability, gender, competitiveness, production systems and value chains is assured.

Increasing productivity and rational use of natural resources, contribute indirectly to the conservation of natural resources and the environment. However, it is still necessary to develop research oriented towards the conservation of natural resources. ESTIS should organize its R&E structure based on catchment areas (basins) or agro-ecological zones and prioritize:

- Conservation and rational use of natural resources especially soil and water.
- Climate change (preparedness, mitigation and adaptation)
- Use and conservation of genetic resources.

For these and other areas of work, ESTIS should implement a priority setting exercise, and select the most priority topics to address through research projects. It is suggested for ESTIS to establish an *ex situ* gene bank, supported and complemented by *in situ* conservation in rural communities. It is also convenient to duplicate selected germplasm and make deposits in global gene banks. Similarly, an animal gene bank should be established.

Policy Development and Institutional Building

The Guyanese Government is promoting the diversification of agriculture and targeting international markets for its products. Hence, ESTIS should adhere to this open economic policy and develop research in this topic. ESTIS research should focus on developing information for policy-makers on the entire range of farmers, from small to large scale; however, at the beginning priority should be given to farmers with limited resources with equity as an objective, in terms of access to resources, information and services.

Few R&E staff are not fully familiar with sectorial policy and its impact on farmers, foresters, processors and consumers. Therefore, a policy training programme would have high return.

It is suggested for ESTIS to address the following areas:

- Support the formulation of recommendations related to national technological policies and to the harmonization with Sub-regional and Regional Policies.
- Support the Guyana's linkage to the International Research System.
- Support the GSA, FAF and National Research System to develop a national R&E agenda and the needed mechanisms to design, execute, monitor and evaluate the projects and activities; and training activities in the use of these mechanisms.
- Support the strengthening of the institutions that constitute the national R&E system, through training activities in management, organization, implementation, monitoring and evaluation of R&E programmes.
- Support activities to integrate the private sector in R&E activities, the formation of a "new farmer/forester-entrepreneur", business and technology-minded and the gestation of new competitive enterprises, with the purpose of marketing new technologies as inputs, processes and equipment.
- Foment the participation of national, sub-regional and international cooperation institutions in the strengthening of the national R&E system.

ESTIS will assist to develop the institutional capacity of its associates, through formal and informal training opportunities for research, extension, managerial and administrative staff. It will also contribute to the effective management of information and communications. It is proposed for ESTIS to implement these activities through the R&E programmes at GSA and FAF and to establish a coordination mechanism for all R&E activities. To complement, the national research system should:

- Play catalytic roles in establishing the R&E agenda for ESTIS.
- Encourage public and private investment in ESTIS
- Inspire efficiency and responsibility within ESTIS.

With Government and international support ESTIS can play a leading role in the establishment of the national R&E agenda, by organizing annually in-country regional and national forums to:

- Identify the technological inventory.

- Identify problems and set priorities.
- Define roles and responsibilities among stakeholders.
- Analyse and evaluate R&E results.
- Approve farmer/forester/processor recommendations.
- Forge consortiums and associations.

It is expected that the results of the regional forums can influence the national and ESTIS R&E agendas, institutional and national policy development, and strengthen institutional capacities. To ensure the effective participation of ESTIS stakeholders in the forums, the following is suggested:

- Encourage farmers to organize in associations, clusters, etc.
- Invite farmer associations to join ESTIS.
- Encourage smaller farmer associations to unite in gremials.

To ensure high efficiency and responsibility within ESTIS, the following is suggested:

- The decision-making capacity should always lie within the Board of Governors, supported by the Technical Council and the Institutional Teams.

Information, Communication and Documentation

The purpose of this Programme is to provide information on technology available or being developed for the priority production and processing systems in the country or sub-region. For this purpose, information banks should be established at GSA and FAF and linked to a national information centre. Each institution will be responsible for establishing and operating its information bank. The national centre should operate at NAREI with ESTIS support.

This Programme will also stimulate information exchange with sub-regional, regional and international information centres and *web* information platforms. The Programme will link the country to information platforms functioning in other countries and will establish an auto-sustainable technology information service for farmers, foresters, processors and other users. End users of this Programme will include:

- GSA and FAF students and staff.
- National R&E institutions.
- Farmers, foresters, processors and professionals.
- Policy-makers.

- National and sub-regional R&E institutions.

Staff Development and Interchange

This Programme includes formal and informal education and training opportunities for GSA and FAF staff, as a base for institutional strengthening. Educational and training opportunities will address those priority needs related to other ESTIS Programmes. These educational and training activities can be supported by national and sub-regional institutions. When the national and sub-regional institutions do not have the comparative advantage to address ESTIS priorities, then, foreign universities and international centres can provide the needed support.

This Programme will also coordinate the interchange of staff between GSA and FAF, with other national institutions, at the sub-regional or international level, when required. ESTIS will forge alliances/agreements with these institutions. ESTIS will pursue the establishment of a post-graduate programme, taking advantage of available national and international financial and human resources.

This ESTIS Programme will inventory the educational resources available at the national and sub-regional levels and will identify human resources specialized in the national priority R&E topics, so that ESTIS stakeholder institutions can develop a staff interchange programme. ESTIS will also target the formation of R&E leaders to develop managerial, policy development and institutional organization competences.

3.7 Resource Inventory

ESTIS will initiate the process of identifying and keeping actualized the resources stakeholders have available for all programmed activities, such as facilities, research farms, equipment and human resources. The inventory should describe in detail the amount and condition of all resources, improvement needs, and assist in drafting maintenance and reposition plans. With respect to staff, the inventory should detail numbers, experience, areas of expertise and training needs.

3.8 Technology Inventory

ESTIS will compile and organize a national inventory of technology available for priority production, processing and marketing systems. The inventory should describe the technology, stability, transferability, adoption rates and limitations. This information will be useful for defining the R&E agendas.

3.9 Mechanisms for Establishing ESTIS' Agendas

The proposed R&E model is participative, it involves researchers, extension staff, farmers, foresters, processors and other users of the technology, and it is based on equity and allows gender analysis, as part of the planning process. Therefore, it is proposed that priorities be set by the Board of Governors. Demand studies and the inventories are useful inputs for drafting the agenda. These priorities are considered at the Executive Level to design the R&E activities to implement. As the research extension system improves its capacity and the feedback channel functions, it will become the main source of information for drafting future agendas. The same process should be used for developing the agendas of other Programmes.

3.10 Financial Mechanism for the Agenda

The proposed financial mechanism for ESTIS has two levels, the first is at the GSA and FAF level and the second is at the System Coordination level. ESTIS funds are for operations, these should not be used to pay salaries. At GSA and FAF levels, funds are for R&E and educational-training activities. At the coordination level, the funds are to be used for linkage activities, between R&E, between ESTIS stakeholders, and for coordination and integration activities.

During the first three years of operation or until its capacity to generate income suffices and the private sector assumes its responsibility to finance R&E activities, ESTIS must be financially supported by the Government with up to 60% of the budget. The remaining 40% should come from competitive public funds and from GSA's and FAF's budgets. It is suggested that the GSA and the University assign 1% of its annual budget and increase annually by 1% until reaching the amount of 3% of the GSA or FAF budget.

3.11 Research and Extension Linkage Mechanism

An operative integration of R&E systems can be achieved through administrative strategies of R&E activities, which define managerial mechanisms that promote collaborative work. The Governors and Director of ESTIS should practise administrative strategies to develop the required environment for encouraging and sustaining the integration of these processes.

To achieve an effective integration, responsibilities and roles of R&E staff must be clearly defined. The consolidation of the integration will depend on how acceptable staff find and accept the division of labour and the load of responsibilities for each process (component) in the system. When assigning responsibilities, it is

convenient to identify integration functions and the expected services and products each component must provide the other.

3.12 ESTIS – National Research – Extension System

It is accepted that the effectiveness of the linkage between two or more R&E institutions or systems, increases as mutual respect and trust grows among the participants. The best way to achieve this is by undertaking joint R&E activities. The mutual respect and trust grows as associates demonstrate their competences to implement research or extension activities.

At first, it may be through events to report research findings, develop recommendations, scientific activities, etc.; but as capacities are developed and strengthened, it is convenient to increase interactions with other associates of the national R&E system. At present, GSA, FAF and public and private R&E institutions share staff, this will allow respect and trust to grow faster. The effectiveness of informal activities in the development of respect and trust is also recognized. Therefore, it is recommended for ESTIS to promote this type of interactions between R&E staff.

4. FINAL COMMENTS

These guidelines should be useful for developing each component and programmes proposed for ESTIS. Thought must be given to national and sectorial priorities when designing and organizing the integrating mechanisms and establishing the first agendas. It will also be necessary to adopt a participative R&E model, in which R&E staff, farmers, foresters and processors interact to achieve common objectives.

A first step is to find supporters and leaders to sell the idea to national influential stakeholders, and gain the needed support to have the idea accepted and financed. A second important step is to establish the IIT, to lead the constitution and operation of ESTIS. A third important step is to take the first step.

