Shaping a new technological era for agriculture in Mauritius

I have the pleasure to present to the nation a five-year strategic plan for the non-sugar agricultural sector meant to stir sustainable development in agricultural diversification and shape a new technological era for agriculture in Mauritius.

As you are aware agriculture in our country has remained mostly traditional and unfortunately has not kept pace with the sophistication and modernisation that has taken place in the other sectors of the economy. When I assumed office as Minister of Agriculture, my priority was to focus on a full appraisal of the sector – both sugar and non-sugar, including an analysis of the major inherent constraints hindering progress and development within the sector.

Right from the start, I was convinced that substantive reforms were urgently needed to give a new boost to the sector. In fact, reforms were long overdue and we had to act promptly. Accordingly, in June 2001, I presented the Sugar Sector Strategic Plan where bold measures have been initiated to ensure the long-term viability and competitiveness of the sugar sector. Today, in the same line, a comprehensive Strategic Plan for the Non-Sugar-Sector is being published, the gist of which is based on the adoption of modern technologies.

The challenges faced by the Mauritian agricultural sector are multi-fold and comprise of pressures on land resources, climatic uncertainties, rising costs of imported inputs, increased exposure to pests, increasingly rigorous sanitary and phytosanitary norms, stringent quality standards in our export markets and harsher competition – just to enumerate a few.

The only answer to the numerous problems and constraints that I have enumerated is the adoption of modern production techniques and innovative technologies in an organised framework. That's what this plan basically aims at.

I strongly believe that survival and progress within agriculture rests largely upon the implementation of a proper technology-based approach. The application of biotechnology in agriculture will be a major endeavour in this direction.

The long-term vision is to make Mauritius assume the role of a service and know-how disseminator in biotechnology application to agriculture at the regional level and eventually emerge as a regional hub, a regional nursery, as a well as a Centre of Excellence for high calibre research, and training.
This plan has also devised strategies with a view to making Mauritius become an agricultural processing hub. To that effect, all the possibilities of using some countries of the region as production bases will be looked into.

The overall aim of the strategic plan is to develop new profitable business avenues in the agricultural field and provide new opportunities to the planting community. My Ministry will give full support to planters and farmers in successfully steering the modernisation process of the sector. I know I can rely on the active participation of the different stakeholders in the agricultural community to ensure the objectives of this plan are met within the set time frame.

Pravind Kumar Jugnauth
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1. OVERVIEW OF AGRICULTURE AS A SECTOR OF THE ECONOMY

1.1 Historical Background

Agriculture has been historically the backbone of the Mauritian economy, characterised for a long time by sugarcane monoculture. Until the early 1970's, export of sugar accounted for more than 90% of all exports. While in the 1970's, agricultural exports represented around 97% of all exports, this figure has witnessed a gradual decline to reach 17% in the year 2000 (See Table 1A). Policies for the diversification of the economy were undertaken since the early 1970’s based, in the first instance, on the manufacturing sector, and later on tourism and services sectors, all three of which proved to be promising. The economy, has, in the process, moved away from its quasi-exclusive dependence on sugar to a more broad-based and diversified one.

Mauritius experienced strong economic growth during the 1980’s and witnessed an increase in its Gross Domestic Product (GDP) rising from MUR 7300 million in that year to MUR 13,800 million in 1985, increasing again to MUR 31,700 million in 1990, and finally to MUR 117,795 million in 2001. The main contributor to GDP in 2001 has been the services sector accounting for about 70% of GDP with the manufacturing and agricultural sectors accounting for about 24% and 6% respectively of GDP (See Table 1B). Growth in the agricultural sector has not kept pace with that of the other sectors of the economy.

1.2 Importance of the Agricultural Sector

Though Mauritian agriculture, dominated by sugar production, is still playing an important role in the socio-economic set-up of the country, yet its contribution to the economy has been declining over the years. This reflects the growing diversification of the Mauritian economy with the secondary and tertiary sectors registering relatively higher growth rates over the last five years. This trend underscores the fact that both in terms of technology input and capital investment, agriculture has been lagging behind.
The contribution of agriculture in the economy has decreased from 23% in the late 1970’s to 16% in 1983, and reached 6% in 2000. Sugarcane production accounts for around 53% of this share. Foodcrops account for around 17% and livestock for 12%, while flowers, fruits and forestry account for the remaining 4% of the share of agriculture to GDP. The share of tea and tobacco to GDP are presently negligible. (See Table 1C). In terms of exports, sugar is the principal commodity to the tune of 86% of all agricultural exports. The country also exports some flowers and foliage but this accounts for approximately 2% of total agricultural exports. Although the local production of foodcrops caters to a large extent for the needs of the population, its contribution to exports has remained negligible. (See Table 1D).

However, agriculture occupies around 43% of the island’s land resources (around 80,000 hectares), with sugarcane accounting for 90% of this total area. The total natural green and forest areas comprise another 30% of the island (around 57,032 hectares, see Table 5B). Direct employment in the agricultural sector stood at 29% of total employment in 1980 but fell to 10% in 2000 (around 50,000 persons) with more than half the number employed in sugarcane production. Additionally, there are 34,000 small planters who are mostly involved in sugarcane production. The small planters have different levels of commitment to agriculture and their plot size in 90% of cases does not exceed 2 hectares. In comparison, there are 23 sugar estates occupying a land area of about 33,000 hectares. This excludes forest lands either owned or leased.
1.3 Agricultural Diversification

After the 1960’s, numerous attempts have been made to promote agricultural diversification. The overall policy of Government in agriculture has been to seize the numerous other opportunities in the horticultural sector, while at the same time reaping the benefits provided under the Sugar Protocol. Agricultural diversification aimed at attaining self-sufficiency in a selected range of foodcrops and livestock products, and gearing production towards exports.

It is worthwhile noting the contribution of small planters who have been instrumental in ensuring supply of fresh vegetables over the years to the population despite numerous economic and climatic constraints.

The approach to agriculture in Mauritius has generally remained traditional. Most of the fertile land remained under sugarcane cultivation. There has been no adequate planning to ensure optimal utilisation of our land resources.

Between 1960 and 1980, development of export for the tea and anthurium industries has been attempted. The former eventually became an unprofitable activity because of quality constraints and uncompetitive prices on the world market. However, anthurium exports, although initiated rather timidly, gained momentum to become an economically viable activity in the early 1980’s. With new prospects offered by this industry, the number of new entrants increased considerably such that by the late 1980’s this sub-sector became the second largest money-generating industry in the agricultural exports sector, after sugar. Also, Mauritius as at to date, is the second biggest exporter of anthurium worldwide after the Netherlands.

Exports of pineapple and litchi have mainly targeted niche markets in the European Union. These items are exported in fresh form, which constitutes a freight disadvantage.
These commodities offer a number of possibilities on the export front which, however, remain untapped as at to date.

Facts and figures have demonstrated that the following factors might have hampered tangible progress in the non-sugar agricultural sector:

(i) the sugar sector being a well established industry offers a certain degree of financial security to agricultural stakeholders;

(ii) planters have a tendency to stick to traditional practice and are either unwilling or not sufficiently encouraged to take advantage of the potential outside the sugar sector which is rather perceived as a risky venture; and,

(iii) inadequate and inefficient planning and management strategies.

Undoubtedly, the advantages that have been derived from sugar production have acted as a deterrent for investment in other non-sugar agricultural activities.

Nevertheless, despite all the constraints highlighted, production in the foodcrop sector which was 36,500 tonnes in 1980 has increased to 129,080 tonnes in 2001. Production of foodcrops, chicken and pork have increased after the 1980’s, and have catered essentially for the domestic market. (See Table 1E).

Nevertheless, profitability to the planting community has remained uncertain due to the unpredictability of auction prices and the consequent inability to align production plans accordingly. Agricultural diversification has also been undertaken by sugar estates but to a limited extent. Whereas few of them produce a diversity of crop and livestock products, the majority has concentrated on interline potato production during the inter-crop season.
Fruit production has been limited to only a few items, mainly banana, litchis, pineapple and mango. Imports of fruits have risen considerably over the years (See Table 3I), the main reasons being:

(i) a rising demand stemming from higher standard of living of the population;
(ii) an increasing health awareness; and mainly,
(iii) the availability of better quality and variety fruits and at cheaper rates than locally produced ones.

Poultry meat and egg production have increased consistently over the years accordingly. In 2001, production of poultry meat reached 27,200 tonnes while that of eggs reached 12,000 tonnes. Pork production increased from 600 tonnes in 1980 to 882 tonnes in 2001, and satisfies a large percentage of local consumption. Venison production remains limited at around 500 tonnes, while beef, dairy, and goat production have been on the decline. (See Table 1E).

Mauritius, as at to date, relies largely on imports to meet the ever-growing needs of its domestic food market. The food import bill continues to increase, and stood at Rs 7.70 billion in 2000, representing about 14% of total imports (See Table 1F). The main imports include cereal and cereal preparations, dairy products, fish products, fruits, vegetables (predominantly in the canned form), meat products, and other similarly significant imports such as vegetable oils and fats, beverages, tobacco and live animals. Failure in meeting the target of attaining self-sufficiency is attributed to a number of factors, the main ones being:

(i) limited land resources with inefficient planning and management for their optimal utilisation;
(ii) economic constraints with limited financial allocation to agricultural development;
(iii) lack of commitment to implement proper diversification strategies; and,
(iv) failure to integrate new emerging technologies with our traditional conventional agricultural practices.

The above have led to Mauritius being at a **competitive and technological disadvantage** in comparison to the other developing states which have successfully adopted and implemented modern agricultural practices.

### 1.4 Overall Challenges of the Non-Sugarcane Agricultural Sector

As demonstrated above, the non-sugarcane agricultural sector in Mauritius is faced with several challenges. **On the domestic front,** the non-sugarcane sector which comprises horticulture, livestock, and agro-industry faces **weaknesses at production, marketing and institutional levels,** which need to be judiciously addressed.

**Production is constrained by:**

(i) failure to adopt new technologies to give a new impetus to the sector and to keep up with market exigencies;

(ii) limited fertile land resources;

(iii) unavailability and high cost of quality planting material;

(iv) inadequate mechanisation and insufficient irrigation facilities;

(v) high cost of key inputs mainly labour cost and high prices of chemicals including commonly used fertilisers;

(vi) inadequate planning of production as per market demand;

(vii) lack of information to the planting community on crop adaptability as per geographical distribution and climatic conditions;

(viii) scarcity of raw materials for agro-industries;
(ix) presence of various non-economic factors which affects predictability of production, such as pest incidence and adverse climatic conditions;

(x) inadequate investment and planning as far as research, intensive technologies, and training are concerned;

(xi) lack of modern management practices; and,

(xii) gradual erosion of the resource base, that is land and labour, in favour of more remunerative sectors such as manufacturing, tourism, and services.

The **absence of a proper marketing strategy** is another major constraint to the development of the Mauritian non-sugar agricultural sector. In the present practice, there has been no efficient link between the production line and the marketing system, such that it has, up to now, not been possible to effectively plan production according to the market demand. As a result, the country is often confronted to extreme situations whereby at times there is a lack of certain items of foodcrops on the local market, while there is overproduction at other times. Additionally, the **need for a proper marketing body/unit with well-defined guidelines** is badly felt by the planting community. In the same respect, the **setting up of an information system for the growing community** becomes imperative.

At the **institutional level**, weaknesses are as follows:

(i) lack of proper coordination between the different institutions;

(ii) inefficient information dissemination as regards existing facilities and incentives provided to the planting community by the Government;

(iii) lack of an appropriate strategy with a service-orientation to the planting community; and,

(iv) inability to adequately respond to the needs and requirements of the planting community.
At the level of the planting community, attempts to regroup planters and farmers under associations and cooperatives have often been unsuccessful. This has hindered the possibility of the planting community of benefiting from existing facilities that they could have secured as a group (e.g. mechanisation and irrigation facilities).

**On the international front**, the combined effects of multilateral and regional trade liberalisation are causing unprecedented changes on the economic scene and are imposing major challenges on the competitiveness front. Agricultural commodities produced at lower prices in other producer countries will compete with local production both for domestic and export markets. Moreover, Mauritius being a vulnerable island state, it will be relatively difficult to cut down cost of production to such extent as to compete with big producer countries with a comparably lower cost of production.

Trade liberalisation within the Southern African Development Community (SADC) and the Common Market for Eastern and Southern Africa (COMESA) countries will increasingly open markets and encourage new entrants. Other producer countries, having the advantages of product diversity and price competitiveness over Mauritius, can in no time flood the local market with agricultural and agro-based products, to the detriment of local producers. The majority of these agriculturally oriented countries have comparatively larger land expanses and cheaper cost of labour than Mauritius.

There is no doubt therefore that Mauritius is confronted with fierce competition on the agricultural front. There is, first and foremost, significant pressure on land utilisation in favour of alternative high-value economic activities. The country is also highly dependent on imports for key raw materials especially fossil-based ones. In view of its geographical positioning, imports of inputs tend to be constraining, and exports increasingly uncompetitive, due to high cost of freight. Being a large importer of food and other items, Mauritius is often considerably affected by changes in world commodity prices and by currency fluctuations.
Moreover, the WTO recent negotiations on agriculture with a view to achieving further trade liberalisation will have a significant impact on the local agricultural sector.

Till now, the main market for agricultural products has been the European Union, through trade preferences initially under the Lomé Convention and presently under the Cotonou Agreement. Such trade preferences have encouraged ACP countries, including Mauritius, to export to the EU countries. The Cotonou agreement will be phased out by 2007 leading to serious threats to the existing preferences which are already being eroded by the ‘Everything But Arms’ initiative. Additionally, Mauritius has lately been adversely affected by the low parity of the Euro vis-à-vis other strong currencies.

On the other hand, with opportunities provided under the Africa Growth and Opportunity Act (AGOA), which aims at fostering trade links between the USA and Africa, the United States may represent a promising market avenue in the future. Along the line of the plan, with emphasis laid on enhanced production volume and quality, there is a need to simultaneously trigger the right mechanism to promote non-sugar agricultural exports more aggressively. Niche export markets may be found within the framework of the AGOA. To conquer a share of the USA market, for instance, it may be necessary to promote our products as aggressively and to lobby as strongly as we have done and continue to do for sugar. We also require up-to-date market intelligence along with the need to establish export quality norms and standards rigorously. But even a very small share of the US market represents a huge opportunity for Mauritius.

1.5 Attributes of Mauritius

Despite the numerous endogenous and exogenous constraints enumerated above, Mauritius has a number of advantages at different levels, which can offer opportunities leading towards a new agricultural era, provided that the right strategies are adopted.
Among the numerous attributes, **physical infrastructure** definitely provides a winning edge. Port facilities and equipment for efficient handling of cargo for timely shipment, an efficient freeport with excellent logistics, modern telecommunications network, good airline links involving world class airlines altogether offer a good competitive edge to the country. Mauritius is also well equipped in terms of inland infrastructure with efficient road, electricity and water networks. Cellular phone penetration is already at a satisfactory level and effort is being made at the national level to reinforce and restructure the information and communication technology infrastructure such as easier access to internet and other online services.

On the economic front, Mauritius has a **proven history as a market economy characterised by a dynamic private sector**. Owing to its successful transition into a newly industrialised economy, a prospering tourism industry, production of quality textiles for leading brand names in the world market, and reputation as an offshore financial centre, Mauritius enjoys a **good ‘country image’ on the export front**. This quality image can be positively extended to benefit our horticultural sector.

These advantages provide possibilities of joint ventures to be extended to the agro-industrial field. In joining the global trend towards multilateralism, the country is at present actively encouraging the emergence and expansion of business concerns through foreign investment and joint ventures. The setting up of a Board of Investment and the associated institutional streamlining aims at further facilitating business development. In parallel, the coming into existence of a series of new legislations governing financial transactions and business, in line with international norms and regulations, will increase security, efficiency and transparency in all such activities.

Mauritius, being an active member of the COMESA, SADC, IOC, IOR-ARC, regional integration and cooperation, will provide a number of advantages that can help in counteracting the constraints of a small island state economy like ours. Already, Mauritian investors are present in the region and new opportunities mainly in Mozambique and
Madagascar are opening up and can constitute promising avenues in the future. **Using Mozambique and Madagascar as production bases at cheap prices to propel agri-business** in Mauritius can prove to be a challenging endeavour in the years to come.

An important factor that will impart a comparative advantage to the country is the **quality of its human resource.** Mauritius can rely on its highly-skilled manpower in a number of specific key-areas to contribute to the development of all economic sectors, including agriculture. Whereas technology can be mass-produced in a short while, the trained human capital is unique. It allows various technologies to be creatively put together. Therefore, the vision of a high-tech agriculture in a sophisticated economy is no longer a far-fetched concept. In fact, Mauritius has at its disposal a pool of professionals with the necessary competencies in various areas of economic activities including agriculture, who can actively participate in triggering the timely boost in agricultural progress, both at the national and the regional level.

At the international level, Mauritius is a member and a signatory of a number of multilateral organisations and conventions. The Mauritian model of socio-economic development is often quoted as a reference among developing states. Mauritius is well known and recognised for its well enshrined democratic values and its respect for human rights. As a result, Mauritius enjoys a good ‘image’ and its views at the international front are increasingly valued. This serves as an attraction for international investors who are more prompted to come to Mauritius for business bringing along the necessary technologies and know-how. Last, but not least, the prestigious relations between Mauritius and countries both in the East and West blocks including Commonwealth and Francophone countries constitute a major element for economic cooperation and development.

Mauritius also has the advantage of **a stable climate and social harmony**, which adds a bonus in attracting foreign investors.
2. **AIM OF THE PLAN**

The aim of this plan is to map out strategies to enhance the role of agriculture and in particular the non-sugarcane sector in the economy and society, in the light of:

(i) the improving standards of living of the population and the **increasing demand for better quality and safer food products**;

(ii) the need to **attain self-sufficiency** in a number of selected agricultural products;

(iii) the necessity to **develop a modern agricultural sector** in tune with the sophistication taking place in other sectors of the Mauritian economy;

(iv) the necessity to **economically and technically empower the agricultural community** especially the younger skilled generation by giving them opportunities and appropriate support to enable them to **emerge as agricultural entrepreneurs**;

(v) the need to **sharpen our competitive edge on the export front** with quality and diversified products taking into account the trade liberalisation and globalisation process; and,

(vi) the importance to **seize all opportunities on the regional front** to **develop Mauritius into an agro-business hub**.
Mauritius is moving towards a knowledge and service based economy. The long-term survival and future of its agriculture should therefore be envisaged along the same policy orientation.

Modern agricultural techniques, if properly adopted, will provide the necessary tools to circumvent our numerous constraints and give a new impetus to our agricultural activities. The application of appropriate modern techniques can help to address a number of current obstacles in the sector. For instance:

(i) Hydroponics culture represents an efficient means of exercising control over a number of parameters to achieve a greater degree of precision in our cultivation practice. Being an intensive technology, hydroponics like other intensive agricultural practices, will help to alleviate the problem of scarcity for fertile land resources. This culture encourages vertical rather than horizontal agriculture, hence offering a number of advantages. It provides a plausible solution to the problem of scarcity of cultivable land. Besides such soil-less culture can be practised even in non-arable areas provided the proper structure is improvised. This will allow optimisation of the utilisation of our marginal lands.

(ii) Impacts of environmental offsets can be counteracted by cultivation under greenhouses which enable better control over adverse climatic changes.

(iii) Greenhouse culture provides a controlled environment hence diminishing the occurrence of pest incidence and the risk of excessive chemical usage. Additionally, such modern structures complemented with sophisticated computerised technologies now enable better control over chemical inputs with a higher degree of precision in line with international norms concerning Pesticide Residue content, hence enabling fine-tuning of production for export.
Application of biotechnology to agriculture (such as tissue-culture, genetic engineering technology, molecular disease diagnostic technologies etc.) will address a number of our immediate problems in the sector.

The main focus will reside in producing high quality produce at competitive prices, be it in the horticultural, livestock or agro-industrial sector, taking into account market tendencies and customer exigencies.

Undoubtedly, the next step would necessitate the adoption of an aggressive and vigorous marketing strategy as regards agricultural products both at the local and export fronts. With regard to export, the strategy will aim at consolidating the country’s traditional markets, searching for new market outlets, and at constantly readjusting production targets based on the market trends.

Research is also another essential component for the sustainability and profitability of any economic activity as regards agriculture, which will be given due consideration in this plan. The aim would be to impart the appropriate research back-up to our established economic industries in the sector, for instance (sugar, anthurium, pineapple, etc) to enable us to exploit the full commercial potential of these commodities and to allow us to keep pace with the changing market tendencies. In this respect, the proposed establishment of the National Food and Agricultural Biotechnology Institute with a dynamic and well-equipped research arm will surely be a spearheading initiative. Research and its subsequent application will represent the golden rule for success in our agricultural sector. Research in horticulture for varietal adaptability and suitability for the industry and its subsequent application in conjunction with the appropriate technologies hold the key to the successful sophisticated agriculture being targeted.

Eventually, as a high-tech agricultural state, it will be essential to encourage transfer of know-how and technology to the region, making optimal use of our technical and
manpower resources. This will enable Mauritius to emerge as a ‘Centre of Excellence’ and as a resource bank in terms of capable manpower resources for regional training processes. In terms of modern technical amenities, Mauritius would also be able to serve as a regional nursery for the supply of high quality planting material.
3. HORTICULTURAL SECTOR

3.1 OVERVIEW

The horticultural sector was revisited in the 1980's, in line with the strategy aiming at diversifying away from the traditional sugarcane monoculture. Attempts were made to develop new export areas within agriculture. Endeavours were concentrated on pineapple, anthurium and litchis production specifically for export while at the same time, focus was laid at attaining self-sufficiency in a number of foodcrops for the domestic market. The sector today is mainly characterised by vegetables, fruits and ornamentals production. The total value-added generated by the sector was around 1.5 billion rupees in 2000.

The Agricultural Services has been a major player in the development of horticulture in Mauritius, together with its mandate for the livestock sector. Conceived as a facilitator and regulator to contribute to the enhancement of food production in a sustainable manner, the Agricultural Services has been playing an active role within the crop sector in the following ways:

(i) dissemination of services to the planting community in terms of:
   (a) planting materials such as seedlings, seeds and tissue-cultured plants for the foodcrop and ornamental sectors;
   (b) analytical services; and,
   (c) quarantine services for the improvement and safeguarding of plant health;

(ii) efficient land resource management;

(iii) development related technology generation and transfer; and,
(iv) Preservation of genetic material of elite and improved species as well as endangered species through its Plant Genetic Resources Unit.

The Agricultural Research and Extension Unit (AREU), since its inception, has also been playing an active role in the promotion of horticultural development, with emphasis on education, training and transfer of technology to the planting community, with a view to optimising productivity and quality. The major activities relate to six main research themes that were identified on the basis of a need assessment exercise. These are:

(a) Introduction, development and testing of new varieties;
(b) Productivity and quality improvement;
(c) Post harvest management and processing;
(d) Optimal resource use;
(e) Introduction of new technologies and products; and
(f) Crop damage reduction.

Major research activities have focused primarily on variety trials, hydroponics technology, optimal fertiliser usage, disease and weed control, seed treatment, soil fertility management, drought management, improvement of use of agricultural residues for crop production, organic crop production and post harvest technology.
3.2 FOODCROP SECTOR

3.2.1 OVERVIEW

Foodcrop growers operate all over the island from the dry lithosols to the superhumid uplands. The total number of growers engaged in foodcrop production for the year 2000 stands at 10,900 with 40% operating on a full time basis, whilst the rest practise agriculture as a side business. These planters cater essentially for the domestic market.

The production of foodcrops increased steadily from 1980 to 1985. A regression was noted during the period 1986 to 1988 which was followed by another increase from 62,280 tonnes in 1989 to 77,519 in 1999. Much of the increase was attributable to larger cultivated areas, coupled with technical and extension assistance. In 2001, production of foodcrops reached 129,010 tonnes representing an average annual growth rate of about 5% over the period 1995 to 2001. For the same period, total area harvested under foodcrop production stood at 7,918 hectares. (See Table 2A).

Prices of fresh foodcrops are characteristically seasonal, with peaks usually in February to April. While production of certain foodcrops such as carrots, cabbages and onions have increased significantly over the past three years, production of cauliflower, chillies and ginger have followed a downward trend. Production of green peas and garlic have decreased significantly (See Tables 2B & 2C). Taking into consideration their respective prices, which are considered relatively high, and the limited volume of supply, it is observed that production of the following foodcrops have generally remained below market demand: green beans, broccoli, ginger, green peas, okra (lady fingers), asparagus, peppers and mushrooms.
Variety trials have been conducted by AREU for a number of foodcrop commodities introduced from different foreign sources with a view to identifying promising varieties suited for the local climatic set-up and geographical distribution. These include onions, cauliflower, eggplant, cabbage, broccoli, chilli, sweet pepper, tomato, chinese cabbage, carrot, squash, okra, cucumber, pumpkin, mushroom, edible-podded pea (petit-pois mangetout), vegetable cowpea, sweet potato, snap bean, palm cabbage, asparagus and vegetable soybean. Such trials have yielded quite conclusive results which helped in a more efficient planning of cultivation at the farmers level both in terms of appropriate varieties and timing of plantation.

Imports of processed vegetables are increasingly competing with, and, substituting locally-produced ones. Exports of locally-produced vegetables have remained negligible, at only 1% of total production. Table 2D illustrates the main exports in the vegetable sector.

With opportunities of production opening up in the region, large land expanses in neighbouring countries like Mozambique and Madagascar are becoming increasingly available to the advantage of Mauritius to top up our local production of certain commodities. Also, owing to seasonal differences, planning of production on a complementary basis could allow to solve the problem of seasonal scarcity at the local level.

Over the years, the main foodcrops in terms of volume of supply on the local market have been potatoes, cooking tomatoes and onions. (See Table 2E).
3.2.2 TABLE POTATOES

3.2.2.1 Local Production

Table potato production is undertaken by various stakeholders. Production is as follows: sugar estates around 36%, the National Federation of Young Farmers' Club around 10%, and the rest is shared between the Mauritius Agricultural Marketing Cooperative Federation and independent growers. Varieties grown are mainly Spunta (approximately 81%) and Mondial (approximately 17%). Mauritius was self-sufficient in its potato requirement in 1982 with a peak production of 23,000 tonnes in 1985. Since, potato production has shown a see-saw pattern particularly between 1993 and 2000, with peaks of 17,000 tonnes (See Table 2F). In 2000, local production was at around 13,800 tonnes and imports stood at 6,900 tonnes. Local production target has been revised from 23,000 tonnes to 20,000 tonnes annually. However, the production is still constrained due to a number of factors including competition for fertile land, agronomic and climatic constraints, as well as poor seed quality and pest and disease susceptibility.

3.2.2.2 Imports

Potato remains a basic food commodity consumed in relatively larger amounts as compared to other foodcrops.

Prior to 1998, the Agricultural Marketing Board (AMB) was the sole importer of potatoes for the local market and Government was granting a subsidy to AMB to cover the price of imported potatoes which was higher than the local wholesale price. A maximum retail price was also fixed by Government.

With liberalisation of imports and price which took effect as from January 1998, Government withdrew all subsidies. As a result, from then onwards, the AMB started to act as a regulator. Following that decision, potatoes were imported in
large quantities (See Tables 2G, 2H & 2I), which, at a given time, coincided with local production resulting into an oversupply on the local market. Price received by local producers dropped from Rs 11,000 per tonne to Rs 7,500, whereas retail price remained high at Rs 14 per kilogram for locally-produced potatoes, whilst price for imported potatoes was only at Rs 11 per kilogram. Considering the fact that producers were encountering difficulties to market their produce, the AMB fixed a guaranteed price to growers of Rs 7,000 per tonne delivered at the Board. In 1999, the AMB provided a guaranteed price of Rs 7,200 per tonne. In 2001, the guaranteed price stood at Rs 9,600 per tonne.

3.2.2.3 Policy

Taking into account the present trends in the potato subsector, it is proposed to:

(i) aim at attaining self-sufficiency taking advantage of production potential in the region on a complementary basis based on seasonal differences;

(ii) decrease our dependence on seed imports by implementing seed propagation programmes from mini and micro-tubers;

(iii) identify suitable varieties for new markets. e.g. varieties ideal for fries for local fast food chains; baby potato etc.;

(iv) monitor the pricing mechanism of the AMB to ensure that local producers do not incur financial losses;

(v) encourage small growers’ involvement in seed production; and,

(vi) set up a seed certification body within the Ministry of Agriculture, Food Technology & Natural Resources.
3.2.3 ONIONS

3.2.3.1 Local Production

In Mauritius, onion is grown mainly for the local market. The local demand which is usually around 12,000 tonnes annually on average, is partially met by local production, while the rest is imported. Per capita consumption of onions has also known a steady increase over the years. Local production of onion has known a steady increase from 3600 tonnes in 1993 to 11,485 tonnes in 2000 (See Table 3 A), largely owing to a wider adoption of high yielding varieties, mainly Yellow Dessex, Red Creole, and Véronique, as compared to the local Red variety.

Around 70% of onion in Mauritius is produced from transplant of high-yielding cultivars in the period of July to November. The remaining 30% of the local production is derived from sets cultivated in the period of March to June. Onion production is highly seasonal with peak harvest around October to November thus leading to a seasonal surplus. The Agricultural Marketing Board purchases about 1,600 to 1,800 tonnes of the surplus from the local producers for storage under refrigerated conditions. Some local producers store small amounts at ambient conditions for short periods, after being naturally dried by either lifting and laying on beds with tops or packed in heaps covered with dried onion leaves. Onions stored at the AMB are then released for sale in the period of shortages.

3.2.3.2 Imports

However, Mauritius continues to import large quantities of onion, standing at nearly 8,476 tonnes in 2001 (See Table 3B), amounting to a total cost of around Rs 79 M. Imports are mainly during the months of February to July in order to meet the local requirements in periods of shortage.
The price of the local Red variety has been liberalised in August 1997, whereas a maximum retail price has been maintained for the other varieties. Although there is no subsidy on onion, the following guaranteed producer prices are being offered by the AMB:

(i) Rs 9,000/tonne for high yielding varieties; and
(ii) Rs 12,000/tonne for the local Toupie variety.

3.2.3.3 Research & Development on Onions

1. Introduction and evaluation of new varieties

Over the past three years, AREU has introduced 63 onion cultivars for experimental purposes from different sources. These have been evaluated in the main onion growing areas namely La Marie/ Glen Park, La Chaumiere / St Martin and Belle Mare/ Palmar/ Trou d’Eau Douce. Out of these 63 varieties, 33 have been found promising in terms of yield and quality of bulbs, 9 of which have been recommended for commercial cultivation since the year 2000.

2. Extension of growing season

One major objective in onion production is to extend the growing season to enable increase in production during periods of scarcity when Mauritius usually finds itself heavily dependent on imports (around the month of July). Several experiments have been carried out in order to identify the suitable varieties and best planting time to ensure production at such targeted periods.

Traditionally only sets of the local red variety were produced in the South East coastal belt. However, experiments have shown that production from sets of high yielding varieties such as Veronique, Noflaye and Star 5504 lead to production
at normally scarce periods as well as produce yields which are twice or even thrice than that obtained from production of local red from sets.

Experiments have also shown that sowing can be delayed to July instead of the usual mid-May in the region of La Marie/Plaine Sophie so as to harvest around December.

3. Post-harvest quality management – Onion curing

With regard to post-harvest quality management in onions, some experiments have been initiated and have yielded some promising results as given below:

(a) A modified steel container was designed for curing of onions and has been evaluated at Glen Park/La Marie in collaboration with the Agricultural Development and Marketing Association. Results have shown that this system could be effectively used to cure 5.5 tonnes of onion in 3 days with prevailing temperatures between 25 – 32°C and relative humidity between 42-72%;

(b) An A-frame mobile plastic tunnel onion curing unit of a capacity of 10 tonnes was designed and tested in 1998. This unit was modified with additional vents and re-evaluated in 1999. It was found to cure 5.5 tonnes in 7-10 days at normal prevailing temperatures and relative humidity;

(c) On-farm trials have shown that application of top dessicant Bladval 450 prior to harvest enhances curing of onion and reduces off-field curing period; and,
(d) Research has also been carried out on water management in onion production at La Marie, disease and weed control and on production of onion seedlings under plastic tunnels.

3.2.3.4 Onion Production in Rodrigues

Rodrigues to date produces around 350 tonnes of onions annually which are bought by the Agricultural Marketing Board at a price of Rs 11,800 per tonne for Toupie variety and Rs 9,600 per tonne for G22 variety as at 2001. (See Tables 3C & 3D)

Production in Rodrigues has, however, known a substantial decline in recent years from 462 tonnes/year in 1997 to reach 339 tonnes in 2000. The major constraints in onion production have been attributed to prolonged water shortages on the island as well as its difficult topographical features.

Harvest time in Rodrigues coincides with that of the La Marie region in Mauritius, resulting in that the AMB has to store those onions from October to January. However, a major disadvantage lies in the fact that the storage capacity of the onions of variety other than Toupie is barely two months, which entails financial losses in storage operations.

3.2.3.5 Policy

In order to give a new boost to the subsector, it is proposed to:

(i) attempt to increase volume of local production by:
   - planning production properly to ensure a constant supply;
- considering the possibility of producing in the region on a alternate seasonal basis; and
- investigating the possibility of using modern technologies for onion production.

(ii) reinforce storage structure and capacity at AMB level and assist planters through their respective organisations to improve storage facilities;

(iii) extend findings of successful onion pilot projects led by AREU on a larger commercial scale;

(iv) intensify programmes in Rodrigues for new variety trials and water management; and,

(v) investigate into possibilities of value addition to onions both in Mauritius and Rodrigues.

3.2.4 COOKING TOMATOES

3.2.4.1 Local Production

Two main types of fresh tomatoes are grown in Mauritius. Major part of the production consists essentially of cooking tomatoes or 'pomme d'amour' with small, acidic fruits. Main cooking tomato varieties grown in Mauritius include MST 32/1, Sirius and Epoch. Production of salad tomatoes or 'tomate salade' with larger and sweeter fruits has started to develop especially through the promulgation of cultivation under greenhouses and tunnels and with the recent introduction of
hydroponics culture. Main salad tomato varieties grown under greenhouse conditions are Cencara, Fanny and Estiva, which are all imported varieties. Varieties recommended for field growing are Mauricia and Delta. There is a small demand for cherry tomato.

Most cooking tomatoes are produced in the open field; whereas salad tomatoes are predominantly produced under greenhouses and tunnels. Tomato production has almost entirely remained the business of small-scale growers most of whom have plot sizes below one hectare. The North of the island has remained the principal producer, followed by the South, the districts of Pamplemousses and Grand Port being the main regions. The most suitable soil types for tomato cultivation have been identified as being light, well drained fertile soils with a neutral or slightly acidic pH on humid latosols.

Tomato can be grown all year round in Mauritius. However peaks in production occur in the months of November to January, but highest yields are obtained during the cooler months of June and July. This crop is particularly sensitive to climatic offsets especially cyclonic and rainy periods when prices normally shoot up.

Mauritius produces a yearly mean of 13,000 tonnes of cooking tomatoes, but effective demand was estimated at 19,000 tonnes in 1999. Production of salad tomatoes is still quite low, not exceeding 2000 tonnes annually. In the year 1999, annual per capita consumption of fresh tomatoes was estimated at 14.4 kg, and that of processed tomatoes at one quarter of the latter on a fresh weight equivalent basis. Imports of processed tomatoes have been on a steadily increasing trend. (See Tables 3E & 3F).
3.2.4.2 Cropping Systems

Cooking tomato is mostly grown as a pure stand crop on sugarcane rotational land. Intercropping with sugarcane is also practiced to a certain extent, but has nevertheless become less popular over the recent years. The system of mixed cropping, i.e. growing two or more crops simultaneously in the same field, is a very common practice in Mauritius. Although tomato can be safely grown in association with many crops such as common bean and okra, it is not advisable to grow it with a number of crops that share common pests and diseases. These include potato, eggplant, capsicum peppers and all cucurbits.

3.2.4.3 Processing

There exists a possibility for using locally-produced tomatoes for processing and developing other value-added forms such as dehydrated, pickled, crystallised tomatoes. However, this will necessitate investment into appropriate processing plants and a re-organisation of the present production system to ensure sustainability through reliable, constant and adequate supply of the raw material. This possibility however requires due evaluation especially from the economic perspective.

3.2.4.4 Research & Development

The MSIRI was the responsible institution for research & development on tomato over the last two decades, following which AREU took over in the year 2001.

In addition to the varieties introduced and tested by the MSIRI, several new tomato varieties have been introduced by AREU in 2000 from the Indo-American
Seed Company for performance evaluation. Five promising ones have thus been identified which can be grown successfully in the local context.

Hydroponics culture of tomato under protected environment has also been promulgated among the planting community by both AREU and the Agricultural Services. Trials are continuously effected to optimise medium and identify suitable varieties. Commercial plantations increased from 6 in 1998 to 28 in the year 2000.

3.2.4.5 Policy

In order to boost this subsector, it is proposed to:

(i) strengthen programmes on introduction and selection of new varieties with a view to identifying high yielding varieties particularly suited to our climate and for processing;

(ii) encourage private initiatives to set up a processing plant to add value to the local produce;

(iii) encourage the use of modern techniques of production for instance hydroponics with a view to increasing yield and quality;

(iv) reinforce research initiatives in this subsector with a view to addressing immediate problems faced by farmers such as disease diagnosis and control, and pesticide usage; and,

(v) strengthen facilities for quality control at the level of seed production and final produce.
3.2.5 CONSTRAINTS SPECIFIC TO THE FOODCROP SECTOR

Smooth expansion and development of this sector has been hampered by a number of obstacles which are mainly of climatic, economic and technical nature.

3.2.5.1 Land Resource

Scarcity of fertile land poses a major obstacle. During the last decade, there has been a rising pressure on land for activities alternative to agriculture. Besides, much of agricultural land has remained under sugarcane. With increasing thrust towards higher value sectors, the pressure on agricultural land will be further accentuated.

Other land related issues hindering optimal foodcrop production are small sizes of plots, their dispersion and ownership, which altogether limit the possibility of grouping of planters for consolidation, mechanisation and modernisation purposes.

Also, rotational land from sugar estates is becoming less available. As per provisions of the SIE Act 2001, sugar estates were required to devote a total aggregate area of not less than 2,300 hectares of land for food crop production and not less than 50 per cent of this area (1,150 hectares) was to be rented out to growers for this purpose. Despite this provision, there have been continuous representations made by planters to the Ministry claiming that lesser rotational lands are being put at their disposal for foodcrop production.

3.2.5.2 Labour

Foodcrop production has remained a labour-intensive activity. This impacts severely on the foodcrop sector in the form of scarcity of labour and rising agricultural wages. Family labour has remained an important supplement in many cases. The labour
component, which accounts for more than half of total cost of production is exacerbated during the cane harvest seasons as scarce labour is absorbed by the sugar industry.

3.2.5.3 Inefficient Marketing Structure

In general, the majority of vegetable growers is not satisfied with the present marketing structure which involves auctioneers and middlemen. The general feeling of the growers community is that these intermediaries, most of the time, reap a significant portion of their profit, depriving them of their fair share. Growers also experience difficulties in obtaining adequate space at the auction level and in securing good and profitable prices due to their inability to efficiently plan production according to market demand.

3.2.5.4 Other Constraints

As depicted above, foodcrop production has remained a traditional activity, complex to manage and subject to a number of uncertainties, notably pest incidence and climatic factors, which make the task of predicting yield and profit difficult.

The way vegetable production is undertaken in Mauritius with specific crops concentrated in some regions and with little crop rotation and sometimes without effective mixed cropping, further renders the cultivation more prone to pest and disease attacks. The fact that currently production is carried out mainly in open fields further exposes the traditional system to unpredictable climatic conditions, and pest and disease incidence. These are today characteristics of the local horticultural sector.

Indiscriminate use and high applications of inorganic fertiliser unaccompanied by appropriate cultural operations limit yield and quality. This is further aggravated by the heavy use of pesticides leading to high cost of production while simultaneously lowering food quality and safety. In this respect, it is worthwhile noting that recent trends worldwide
favour a pesticide free agriculture with more pronounced consumer exigencies as far as food safety, and quality norms are concerned. The increasingly stringent regulations coming into force regarding the entry of horticultural products on traditional export markets, especially the European Union, pose severe impediments to the future of our exports in the sector. The inability of our Mauritian producers and exporters to comply with the required standards in the present system, coupled with the lack of relevant expertise and skills to allow them to respond to the ever-changing exigencies of the export market altogether lead to our inability to achieve the required competitive edge. In this context, for any future development of export within the sector in the future, it has become essential to:

(i) review the whole production system within its agriculture fostering a philosophy of decreased usage of chemical inputs; and,

(ii) reinforce the quality process at all levels especially at the post harvest stage to guarantee the credibility of Mauritian producers and exporters as well as customer satisfaction.

The need to conduct a census of the whole agricultural sector is acutely felt today. It is surprising to note that such an exercise has never been performed for this sector despite the fact that it has been playing a major role as an economic sector in the country for years. Such a census would greatly assist the Central Statistics Office in the preparation of the economic accounts for the sector, which it is called to do, and which has been based on ad hoc production cost surveys of planters and on technical coefficients provided by the Ministry and related parastatals for the last 25 years. These data often are deficient in important parameters which are however essential in the precise determination of economic factors. This census would, furthermore, help in revamping the project of setting up an Agricultural Information System of the Ministry which would assist in conducting production cost surveys for the sector. Statistics collected from the census would provide more accurate and reliable benchmark data and thus assist policy decision makers in the productive planning of future development in the sector.
3.2.6 REMEDIAL MEASURES IN PLACE

A number of policy decisions have already been initiated with a view to addressing some of the major constraints that hinder development of the foodcrop sector. They are as follows:

(i) With regard to the problem of land scarcity which foodcrop growers are increasingly confronted to, Government has recently amended the SIE Act of 2001, whereby the percentage of the area of land out of the 2300 hectares allocated for foodcrop production to be rented out by sugar estates to growers would be increased from 50 to 65 percent. The outcome of that decision is that, instead of the 1,150 hectares of land which were formerly made available by sugar estates, foodcrop growers would benefit from 1,495 hectares, while the total aggregate area devoted for this activity would be maintained at 2,300 hectares.

(ii) Government has also initiated actions to sustain its policy of agricultural diversification in view of the fragile situation prevailing within the sugar sector by providing supportive measures to promote the development and expansion of the foodcrop sector in Mauritius. Along this line, the phase II of the Northern Plains Irrigation Project (NPIP) aims at strengthening the agricultural sector in the Northern Plains, which has a relatively large concentration of small sugarcane and foodcrop growers, by improving irrigation, infrastructure and supporting services. With the improvement of irrigation facilities brought about by the construction of the Midlands Dam and the replacement of M1 pipeline, Government is seeking to set up a system of support services to the agricultural diversification component of the NPIP project. This diversification component aims at stipulating a diversified and sustainable economic development for small and low-income planters with
the overall objective of increasing the acreage under foodcrop (vegetable and fruit) cultivation in the northern plains by some 700 hectares once irrigation becomes available. This objective will be achieved by:

(i) providing more cost effective production systems including irrigated crop production and the use of modern technologies to ensure higher yields and stability of income;
(ii) strengthening the ability of planters to compete in the local and export markets to meet evolving consumer needs and maximize profits; and,
(iii) diversifying into non-sugar foodcrops to ensure a higher degree of national self-sufficiency.

To this effect, an incentive package has been worked out with a view to encouraging growers in the northern plains to diversify into foodcrops in order to achieve the set target of 700 hectares. This package would consist of the following components:

(i) **Cultivation of Foodcrops**

   Soft loan from the Development Bank of Mauritius to a tune of Rs 50,000 per arpent to growers certified by AREU, at 3% interest rate with a moratorium of 1 year and repayment period of 4 years.

(ii) **Setting-up of Fruit Orchards**

   Soft Loan from the Development Bank of Mauritius to a tune of Rs 100,000 per arpent to growers certified by AREU, at 3% interest rate with a moratorium of 2 years and repayment period of 7 years.

(iii) **Purchase of Irrigation Equipment**

   Soft loan for the purchase of irrigation equipment at 3% interest rate, covering up to a maximum of 80% of the total cost and repayable over 6 years.
(iv) **Donation of Seeds**

At the initial stage of the diversification, free seed vouchers would be provided to growers for provision of seeds from the Barkly Experimental Station of the Ministry. Seed vouchers will also be provided entitling growers to a 10% discount, through a Government subsidy, to purchase imported seeds from local suppliers.

**Professional technical assistance has been sought to support this diversification process**, and this project has benefited from European Union funding. The team of consultants, which consists of a coordinator/extension specialist and a market information specialist on a long term basis, supported by shorter-term supportive consultancy services, will have the responsibility of creating the enabling environment for the adoption of a more entrepreneurial and market-oriented approach coupled with modern management practices by the planting community. This will include aspects such as Farm Management for Small-Scale Agriculture, Ethnic Food Production for Exports, Post-Harvest Technology and Processing, Nursery Management, Seed quality and Orchard Management. The market specialist will also play a central role in initiating the setting up of a Market Information System (MIS) for the non-sugar agricultural sector as is proposed in Chapter 17, which will be instrumental in reorganising the sector with a demand and market-driven orientation.

The overall target would be to increase productivity in the foodcrop sector through the use of modern production techniques and to assist planters to derive better profits through the inculcation of a professional approach.
(iii) Conscious of the heavy investment required in the adoption of modern cultivation practices, Government has put in place several mechanisms to provide **incentive measures** with a view to easing the financial burden that this transition imposes on growers. In this respect a **number of financial incentives has been established in an attempt to assist growers in meeting the initial investments as well as the associated increase in running expenditures**. With regard to financial assistance towards initial investments, **soft loans and duty exemption facilities** are provided to meet infrastructural and equipment expenditures. More details are provided in Chapter 18, Section 18.3.2. The two major running expenditures associated with modern agricultural practices include irrigation water and electricity. In this respect, a `**Subsidy on Electricity Scheme**` was set up under which small planters islandwide are entitled to a **refund of 50%** on the cost of electricity incurred in connection with the irrigation of their plantations. Along the same line, provision was made to **provide subsidy on irrigation water** to all planters operating within the boundary of an irrigation project.

(iv) In line with this Ministry’s policy towards establishing a **quality culture within the horticultural sector**, which has now become a **sine-quanon condition for the development and sustainability of exports in the sector**, there has recently been a private sector initiative headed by the APEXHOM (Association des Producteurs et Exportateurs Horticols Mauriciens). A project proposal entitled **‘Setting-up of a Quality System for the Horticultural Export Sector in Mauritius’** has been submitted to the European Union for funding assistance towards achieving the targets set. This project fits in the context of the harmonisation of the European regulations on the Maximum Residue Levels (MRLs) of pesticides on food products and the All ACP-Pesticides Initiative Programme, which has been recently launched.
The main components of the project consist of:

(a) establishing and implementing a National Code of Practice;
(b) delivering training and professional advice;
(c) providing access to technology, know-how and skills;
(d) establishing new production and export avenues; and,
(e) reinforcing the communication and information systems within the sector.

The overall objective is to provide a basis to enhance high quality productivity within the sector to increase the overall percentage of exportable products, to sustain capacity building process and the development of value-added skills within the sector and to improve services offered to all stakeholders within the horticultural industry to enhance profitability of activities.

3.2.7 Policy for the Foodcrop Sector

Government being aware of the numerous challenges facing the foodcrop growers, in light of the vulnerability of the sector, proposes to take the following measures:

(i) conduct a census of the whole agricultural and livestock sectors through the Central Statistics Office with a view to constructing an updated list of agricultural holdings to enable selection of appropriate samples for production cost surveys, and better planning of the sector in general. Information that would be sought would comprise:
   a. a list of all agricultural stakeholders in various sectors of activity including breeders;
b. data on goods and services produced in the sector;
c. estimates of production costs and yield;
d. details on marketing and capital formation etc; and,
e. information on the socio-economic background of agricultural households.

It is also envisaged to have an audit of production, technical support and institutional efficiency with a view to identifying weaknesses in the sector and accordingly formulating remedial actions.

(ii) establish a Land Data Bank for efficient land planning and optimisation of use of land resources;

(iii) encourage the adoption of new technologies towards a modern agriculture to enhance production in terms of volume and quality and sensitise planters on efficient methods of irrigation;

(iv) define the needs of the planting community in terms of planting material and ensure, as far as possible, a constant and adequate supply;

(v) reinforce research and development efforts towards producing high quality planting material locally (hybrid seeds and tissue culture plantlets) with a view to decreasing current imports;

(vi) establish an efficient marketing system which will identify new market avenues and market exigencies for foodcrop growers as elaborated at Pg155 of Chapter 17;

(vii) set up a Foodcrop Insurance Scheme under the Small Planters Welfare Fund;
(viii) set up a ‘One-Stop-Shop’ for the horticultural sector that would provide a series of services to all agricultural stakeholders including, *inter-alia*, technical and marketing advice and documentation facilities;

(ix) align production with respect to international norms and standards to gear production for export and value addition;

(x) carry out a survey of foodcrops currently produced below market demand with a view to channeling more effort towards meeting the local demand;

(xi) reinforce training to planters at various levels;

(xii) encourage wherever possible grouping of farmers to take advantage of the economies of scale and block management;

(xiii) set up an ‘Irrigation Liaison Committee’ for the non-sugar sector to be led by AREU and grouping all relevant stakeholders, to look into irrigation issues/problems islandwide, on a region-wise basis;

(xiv) encourage the grouping of planters, who are private land-owners, into ‘Water Users' Associations' for the implementation of irrigation schemes for a more judicious utilisation of irrigation water;

(xv) set up an ‘Irrigation Association’, a joint public-private sector forum, to exchange views on water usage and irrigation technologies;
(xvi) look into the possibility of encouraging importation of commonly used chemical inputs by Cooperatives, in view of their high costs on the local market;

(xvii) invest into research possibilities in biotechnology to create novel varieties of locally grown foodcrops with conferred novel traits such as disease resistance, increased yield, enhanced shelf life of perishables etc.;

(xix) exploit regional possibilities as production bases with a view to supplementing local production to counteract periods of scarcity on the basis of climatic and seasonal differences; and,

(xx) establish a ‘Monitoring Taskforce’ at the level of the Ministry of Agriculture for constant interaction with the planting community in order to obtain continuous feedback and allow timely implementation of remedial solutions.

The policies enunciated above are being dealt with in extenso in later chapters.
3.3 FRUIT SECTOR

3.3.1 Local Production

Around 50 species of fruits are currently grown in Mauritius, out of which around 20 are mostly popular in backyards (~580,000 trees) and contribute significantly to fruit consumption at household level. Fruit species grown on a commercial scale are mainly pineapple, banana, citrus, litchi, mango, papaya and passion fruit.

Fruits like litchis, citrus, mangoes and bananas are cultivated in small orchards and backyard gardens, and also in large orchards (See Table 3G). The total area of cultivation is estimated at around 2120 hectares. Of this acreage, small orchards and backyard gardens occupy around 76% while the remaining area is occupied by large orchards. The main fruits grown in backyard gardens and small orchards are mangoes, citrus fruits and litchis. Area occupied by mango cultivation stands at 1100 hectares compared to 246 hectares for litchis. Cultivation in most of the large orchards is dominated by banana to the tune of 76%.

In 2000, production of litchis, bananas and pineapples were estimated at 700 tonnes, 8500 tonnes and 3400 tonnes respectively, harvested on a combined area of 810 hectares (See Table 3H).

3.3.2 Importation

Import of fruits has been steadily increasing with the improving standard of living, greater health awareness with regard to food habits as well as accessibility to high quality and variety of imported ones at more competitive prices compared to the local
produce. In 2000, imports of fresh fruits reached 16,000 tonnes while import of preserved fruits, and fruit juices reached 7200 tonnes (See Table 3I).

**Per capita consumption of locally-produced fruits have remained low** and below potential market demand (See Table 3J) as there seems to be a preference for imported substitutes on the basis of their quality and price benefits. Imported fruits, which often flood the local market, are available throughout the year at relatively low prices.

### 3.3.3 Research & Development

AREU has been conducting research within the fruit sector with a view to:

(i) identifying new fruit crops and elite varieties for the local and export market;
(ii) generating and adapting new technology;
(iii) increasing and improving fruit production for export;
(iv) optimising post-harvest management practices; and
(v) developing processing techniques for value addition to the local produce.

The following experimentation have been undertaken in this regard:

(a) Introduction and evaluation of imported cultivars of banana, litchi, mango, avocado, strawberry and papaya;
(b) Manipulation of fruit trees to promote flowering and fruiting (e.g. Girdling of litchi);
(c) Improvement of production systems (pineapple, strawberry);
(d) Improvement of bunch management in banana;
(e) Identification of early bearers and trees producing fruit with small seeds from local clones;
(f) Post-harvest studies to increase shelf life of banana and export potential of litchi; and,

(g) Processing studies – setting up of a processing laboratory and training of local entrepreneurs.

With a view to promoting fruit processing and preservation, as a means to decreasing wastage of local fruits during peak periods of production when production by far exceeds the consumption capacity, the expertise of Chinese technicians has been sought under the Chinese Agricultural Technical Cooperation Scheme. The objective is to undertake single transformation techniques on local fruits available from seasonal gluts at domestic scale in the first instance, with possibility of expansion eventually. Currently preservation/transformation experiments are being carried out on the following fruits: papaya, litchi, tomato, pineapple, banana and chinese guava. Products include jam, purée, dry preserve, paste, and preservation in syrup.

The FARC, at its end, has been mainly concentrating on the supply of high-quality tissue-cultured plantlets of banana to the planting community. Elite superior cultivars have been imported by this organisation from reliable foreign sources and mass propagated to satisfy the local demand. These plantlets are distributed at a highly subsidised price of Rs 5 per plant with a view to encouraging local production. This programme is expected to carry on with closer collaboration of the Agricultural Services. With a view to ensuring that the plantlets ultimately sold to the planting community are of the desired productivity and quality, it is proposed to reinforce the performance evaluation component presently carried out, through a more rigorous field experimentation programme. This exercise would provide a good indication of the productivity of the plants prior to their commercialisation.

The Barkly Experimental Station has been indulged in production and supply of planting material of a number of fruit trees, such as litchi, citrus, coconut, papaya, mango, just to state a few, though grafting, layering and seedlings mainly. Research
initiatives in this respect have been essentially directed towards optimisation of techniques of rapid propagation and cultural practices.

The Entomology Division of the Agricultural Services has been involved in an active area wide programme on Fruit Fly control since 1994. Fruit flies constitute a serious limiting factor to fruit production, whereby traditional methods as well as chemical control methods failed to be effective. The programme managed to successfully control the infestation by the use of suppression methods namely Bait Application Techniques (BAT) and the Male Annihilation Techniques (MAT).

3.3.4 Main Exports in the Fruit Sector

Within this sector, Mauritius has attempted to export litchis and pineapples mainly, and, a number of other commodities on a smaller scale such as mangoes, melons and passion fruits (See Table 3K). Exports in general have been, however, limited in volume essentially due to the fact that producers have been unable to efficiently tap all opportunities according to specific demands, norms and seasons. Small plot size coupled with the lack of appropriate planning and marketing strategies in the sector have also been major constraints to its development. Vulnerability of the sector to climatic offsets, which inevitably impacts on the volume of production, also imposes restriction on further development of exports within the sector. High cost of airfreight and small profit margin have been additional factors which have hindered exports in the fruit sector.

Litchis and pineapple exports which are seasonal activities with peaks in summer, account for a substantial fraction of exports and are essentially geared towards niche markets in European countries.
3.3.5 Pineapple Industry

3.3.5.1 Local Production

The main commercial varieties grown in Mauritius are the Queen Victoria and the Smooth Cayenne. The Queen Victoria variety is however, the main exportable variety finding a comparatively stronger demand in our niche markets. Mauritius is one of the only three countries worldwide involved in the commercialisation of this variety. Additionally, due to its relatively shorter shelf life, this variety is exported via airfreight. On the other hand, the Smooth Cayenne variety having a longer shelf life is suited for export by sea.

Grown since the early 1950's for export, pineapple cultivation now covers an area of around 122 hectares with an approximate annual production of 2000 tonnes of which around 500 tonnes were exported in 2000. (See Table 3L & 3M). Improved cultural practices coupled with the adoption of careful selection and propagation techniques over the years have enabled Mauritian pineapple to develop fruits of the Queen Victoria variety with reduced crown size, which imparts a freight advantage to the commodity.

Although the actual local pineapple production is mostly targeted towards the end of the year, Mauritius nevertheless has the potential to produce and supply pineapple all over the year, with proper planning of planting time and appropriate floral induction treatments.
3.3.5.2 Constraints to the Industry

In June 1997, a study was commissioned by the ‘Comité de Liaison Europe-Afrique-Caraïbes-Pacifique’ (COLEACP) which is responsible for the promotion of ACP horticultural exports. The aim was to identify weaknesses of this industry and to accordingly propose plausible solutions to allow us to reap optimal commercial benefit of this commodity.

The study has described the main loopholes of the industry as follows:

1. **Technical problems at the planters' level:**
   
   (i) Definition of the correct planting density;
   
   (ii) Nutritional requirement of the pineapple plant;
   
   (iii) Pest control;
   
   (iv) Need for mechanisation; and
   
   (v) Harvesting techniques to prevent mechanical damage, definition of appropriate harvest time, and know-how in post-harvest handling.

2. **Problems at the marketing level:**

   (i) High cost and availability of airfreight; and
   
   (ii) Deficiency in packaging systems which affects shelf-life and product freshness.

There is an absolute need to exploit value added potential of this commodity in order to be able to reap optimal profit and avoid unnecessary exorbitant freight payment on non-edible parts. Vacuum packaging for exports is a promising avenue in this respect, which is presently under experimentation.
3.3.5.3 Policy

In order to further develop this promising industry, it is proposed to:

(i) provide technical and financial assistance through the TIDS scheme for introduction of technology in the sector;

(ii) provide analytical facilities to ensure conformity to international norms with regards to quality and residue content; and,

(iii) encourage research and development on:

(a) quality of planting material, cultural practices and broadening of range of commercial varieties;
(b) pest and disease control;
(c) development of post-harvest handling techniques;
(d) development of an efficient packaging system to extend the shelf-life of the local pineapples, and
(e) organic production of pineapple.
3.3.6 Litchi Industry

3.3.6.1 Overview

Introduced in Mauritius by Chinese immigrants since the early 19th century, litchi has since been extensively grown mostly in backyards. Litchi is today one of the most popular seasonal exotic fruit in the country, appearing on the market between early November to early January.

3.3.6.2 Local Production

The main commercial varieties are Tai-So (approximately 98% of total production), India and Calcuttia (the remaining 2% of total production). Production however is not well organised. Trees are normally sold at time of flowering to exporters.

Between 1989 and 1992, eleven new varieties were introduced for experimentation from Australia and three from China. These are still under observation at the experimental stations of the Ministry. The objective is to identify early and regular bearing, high yielding and high quality varieties. Preliminary results have identified one of the varieties as being promising in the local context in terms of earliness of bearing and quality.

3.3.6.3 Export

Export of litchis was initiated in 1934. Since the mid 1980's, there has been regular export mainly to Europe with a peak of 250 tonnes reached in 1988. The export volume now averages at around 100 tonnes annually. However in 2001, an increase in
production has been recorded and the country has been able to reach an export volume of 159 tonnes. (See table 3N).

3.3.6.4 Main markets

Up to now, export of litchis has been directed to the European Union only, with France being the main importer. There is a window of opportunity for Mauritian litchi during the first two weeks of November towards the European Union. (See Table 3 O ).

An unexploited market exists in the Middle East (as an exotic fruit), Japan and South East Asia (an off-season market). In order to encourage export in this sector, Government introduced a 50% freight rebate scheme in 1991. Furthermore, Mauritius has the advantage of being served by direct airline connections in a number of major European destinations like London, France, Munich, Geneva, etc. The new airline connection to Dubai opens the door to developing existing opportunities in the Middle-East.

Mauritius has the advantage over other litchi producing countries in the region due to the ability of its trees to mature earlier. However, the full potential of this advantage has not been adequately tapped. Timing is critical in order to exploit this early window and obtain premium prices in our markets. Harvesting at a premature stage and sulphuring to induce ripening are common practices which do not enhance the image of the Mauritian litchis.

The major weakness identified on the export front involves a lack of know-how in packing and storage aspects, and improper post-harvest treatments.
3.3.6.5 Policy

In order to give a new boost to the industry, it is proposed to:

(i) identify potential sites for establishment of orchards;

(ii) introduce and evaluate new varieties;

(iii) consider the introduction of dwarf varieties;

(iv) provide technical guidance on modern production and quality management techniques;

(v) improve post harvest techniques and promote value addition;

(vi) ensure continuous supply of high quality planting material to the planting community; and,

(vii) investigate into alternative, quicker and better methods of propagation of planting material.
3.3.7 Other Fruits

3.3.7.1 Mango

Mango is another tropical fruit plant that grows naturally in abundance in Mauritius owing to its highly favourable climate. Mango production is essentially a backyard operation with a few established orchards. Production peaks in summer months from October to late February. Mauritius offers a wide range of varieties for the local market suited for consumption in the fresh form and for processing. However, only one variety namely Early Gold has been identified as being suitable for export.

3.3.7.2 Exotics

Mauritius grows a range of exotics which may be exploited for their export potential, e.g. star fruit, bilimbi, mulberry (mirte), jamalac, fruit de cythère, jujube, etc. Some of the above are being exported already in very limited quantities.

Processing of fruits, like vegetables, can represent a promising avenue if the required volume of production is achieved.

There exists scope for developing fruit production in view of:

(i) the island’s wide range of agroclimate;
(ii) the progress achieved in fruit fly control;
(iii) the growing demand for quality fresh and processed fruits on the domestic market, especially with the expanding tourism industry;
(iv) the export potential of exotic fruits with appropriate value-addition; and,
(v) the suitability of our local species for organic production.
It is also essential to sensitise local consumers on the value of our locally produced fruits in comparison to the imported ones.

3.3.7.3.1 Policy

In light of the above, Government proposes to encourage the development and expansion of the local fruit production to satisfy the growing domestic needs and to encourage exports.

In this connection, it is proposed to take the following measures:

(i) encourage the establishment of pilot orchards for evaluation of new varieties;

(ii) investigate into more effective orchard management methods for the local market as well as for export in fresh and processed form;

(iii) improve local marketing system for fruits and sensitise the population on the need to consume locally-produced fruits;

(iv) encourage more regular production of quality fruits through the strengthening of appropriate extension support;

(v) encourage mass propagation of high quality and high yielding planting material for specific fruit varieties through the use of biotechnology; and,

(vi) encourage research in post-harvest handling techniques and value addition to the local produce.
3.4 ORNAMENTAL SECTOR

3.4.1 Overview

Since the 1960's, the floriculture industry has been largely dominated by anthurium, which, since the early 1980's, has become a well-established export industry. It represents the second largest money-generating industry in the local agricultural exports sector after sugarcane, and positioned Mauritius as the second biggest exporter of anthurium on the world market as at 1999, following the Netherlands.

The average annual export revolves around 15 million stems being at its peak during the months of October to April. However, export is facing a downward trend since 1997 both in terms of volume and price fetched on the market.

3.4.2 Anthurium Exports

A comparative study of the markets shows that in 1986, Italy topped the list of importers of anthurium from Mauritius followed by Australia, France, Switzerland and Reunion Island. In 1991, Italy still occupied the first position, and the next largest importers were Japan and Taiwan. Recently, there has been a marked shift towards Asian markets, namely Japan and Taiwan at the expense of the traditional European markets. According to 1998 statistics, Japan has taken the lead with an annual import of approximately 10% of the total volume of exported Mauritian anthurium, followed by Italy and France. (See Table 3P)

Figures show that the volume of exports has decreased from around 16.5 million in 1995 to nearly 13 million in 1998 (See Table 3Q). This tendency can be explained by a number of reasons, the main one being the unavailability of new varieties, particularly from the Netherlands, to offer a complete range of flowers to the importers.
3.4.3 Present Status of the Anthurium Industry

The outbreak of the devastating bacterial blight disease caused by Xanthomonas campestris p.v dieffenbachiae in most of the foreign supplier nurseries had led to the imposition of a ban on the import of tissue-cultured plantlets in 1997. Consequently local anthurium growers were faced with an acute difficulty of access to new varieties, which were formerly being procured from the Netherlands, and were, as a result, unable to respond proactively to the changing market exigencies. Some growers have initiated their own breeding programme through conventional means, which are however too time consuming. In the meantime, the traditional locally grown commercial varieties Ozaki and Nitta which comprise the bulk of the local production are running out of fashion and are not fetching good market value any more.

As a remedial solution, the Agricultural Services have set up a Plant Quarantine Screenhouse, which started its operations in 2002. This screenhouse would serve as a quarantine service for the safekeeping and close monitoring of newly introduced germplasm prior to release in the open environment. This facility, by allowing the safe introduction of new planting material, would lessen the risk of disrupting the disease free status of the country. The coming into operation of this unit has enabled the lifting of the import ban on anthurium which has thus given a new boost to the sector, by allowing the safe introduction of germplasm of new varieties for breeding and commercial purposes.

Our long characterised over dependence on the Dutch varieties, with no provision made to create typical Mauritian ones through an appropriate breeding programme, again highlights the price we have to pay for not sustaining our economic industries with a strong research back-up.
The latest study commissioned by the ‘Comité de Liaison Europe-Afrique-Caraïbes-Pacifique’ (COLEACP) was effected in 1997 by a team of experts with a view to investigating into the possibility of optimising production and post harvest handling in the Mauritian anthurium industry and looking into the diversification potential of the Mauritian floriculture. This report highlighted the main constraints of the anthurium sector over and above the varietal problem, as being:

(i) scarcity of growing medium with decreasing availability of bagasse;
(ii) lack of adequate technical support in crop management techniques, harvesting and post-harvest practices;
(iii) no insurance cover to protect against damage in cyclones;
(iv) increasing cost of production with increasing labour cost;
(v) no cold chain distribution facility to ensure maintenance of optimal quality of flowers from harvesting to shipment time;
(vi) high air-freight charges towards major potential destinations e.g. Japan (~ Rs 60/kg); and,
(vii) lack of proper marketing system which encourages internal competition among local producers/exporters for the same markets hence leading to decrease in value fetched.

3.4.4 Promising Exotics

The report also highlighted a number of exotics as having potential of being successfully grown in Mauritius and at the same time, representing possible export avenues in the future. These include heliconias, gingers, flowering bananas, flowering pineapples, tropical cut foliage and probably even streptelizia, despite its freight disadvantage. Reasonable success has already been achieved with some of the above. Some of them are currently being exported along with anthurium, in an attempt to offer the variety that our markets are searching for. The export of cut foliage is gaining momentum
and recent trends demonstrate a lot of potential in this area for export. (See table 3S). Volumes of export of these items, however, remain very slim owing to their limited local production. Therefore, the right strategy to derive optimal economic benefits from them remains to be devised through the initiation of an appropriate diversification programme of the sector with a view to encouraging the local production of such high value commodities.

3.4.5 Imports

Recent import data illustrates a growing demand for flowers on our domestic markets which are often not being satisfied by our local production. (See Table 3R). Countries like South Africa amongst others, are often being resorted to for supply of flowers especially during peak seasons of festivities. Currently flowers like carnations, gerbera, chrysanthemums, gypsophilias are being imported to supplement the local markets.

3.4.6 Incentives for Diversification

In fact, the objective to diversify the Mauritian floriculture is now gaining momentum in light of the increasing demand for flowers on the domestic market and the existing production potential of Mauritius from a climatic point of view, coupled with difficulties prevailing in the anthurium industry. Also, with the advent of the Zero Pesticide Residue Regulation in the European Union, Mauritius should capitalise on its export potential in the floricultural sector.

A number of incentives has been accordingly provided by the Ministry of Agriculture in order to aid this diversification policy along with technology introduction.
Through the **Technology Introduction and Diffusion Scheme (TIDS)** for instance, **financial assistance** at a rate of 50-75% is provided to growers towards professional consultancy services. A number of beneficiaries of this scheme are found in the field of floriculture, and fruitful attempts to professionally grow roses, gerbera and even carnations on a commercial scale have been recorded.

Facilities such as **duty exemption on greenhouse structure to encourage a modern agriculture** are also extended to producers in the floricultural sector. Considerable quality improvement has been recorded with the use of modern techniques of cultivation. This is a positive step towards the target to cut down on the imports in this sector and to eventually fully satisfy the demand of the local market.

### 3.4.7 Research & Development

Taking into account the potential of the flower sector, much effort has been channeled particularly over the last decade into research and development in this area with a view to giving a new boost to it and assisting in an optimal manner the planting community. **Research and development initiatives have been reinforced in various departments putting emphasis on anthurium whilst at the same time evaluating other potential new floricultural commodities** identified by foreign experts. However, research has so far been mostly restricted to propagation of indexed planting material.

AREU has been primarily looking into possibilities of **optimising alternative growing medium for anthurium** in view of the decreasing availability of bagasse. Research into breeding for varietal development and rapid propagation of anthurium has also been initiated at experimental level. Through its extension services, on site services have also been provided to flower growers in cultural and disease control practices.
At the Barkly Experimental Station, research effort in floriculture has mainly focused on rapid clonal propagation of planting material. Success has been obtained with orchids of a number of varieties of dendrobium and phaelenopsis which have also been commercialised. This institution has also initiated protocol optimisation programme for the in-vitro propagation of a number of anthurium varieties. This attempt is still at the experimental stage.

The FARC has developed joint collaborative research projects with two private local anthurium companies in the field of mass propagation of selected varieties by tissue culture. Results of protocol optimisation have been promising and will be implemented on a commercial scale in the near future. Micropropagation of other ornamentals such as gerbera have also been undertaken.

In an attempt to promote transfer of technology to the planting community within the flower sector, various workshops and training programmes have been organised by the TIDS and AREU through foreign expertise. The themes for these workshops and training programmes have been devised on the basis of the needs of the planting community and on established priorities, and have mainly focused on modern cultural practices (modern fertigation systems and production under controlled environment), disease and pest control, post harvest handling and packaging.

3.4.8 Policy

With a view to giving a new technology based commercial approach and putting into place of an appropriate mechanism for the implementation of a diversification programme, it is proposed to:

(i) carry out a study on the anthurium sector with a view to identifying the major threats;
(ii) consider the possibility of reviewing the new loan scheme regarding the modernisation of the anthurium sector and the setting up of chilled rooms;

(iii) carry out pilot projects to identify potential flower species for commercial ends and sensitise planters accordingly;

(iv) strengthen technical facilities provided to planters to allow problems at the production level to be addressed at an early stage;

(v) encourage modern techniques of cultivation by extending financial assistance provided by TIDS and by reinforcing technical and extension support provided by AREU;

(vi) reach an agreement with sugar estates to obtain a fixed quota of bagasse (a major growing medium) annually exclusively for this sector;

(vii) strengthen research locally into finding potential substitutes to bagasse and look into the possibility of importing potential alternative growing substrates, such as coco peat from Agalega;

(viii) initiate research in the development of new varieties of anthurium and other potential commodities through genetic engineering with the coming into operation of the Mauritius Agricultural Biotechnology Institute;

(ix) reinforce research into effective and plausible soil sterilisation techniques including biological control methods;

(x) provide training to growers in post harvest technology and nursery management;
(xi) work out a mechanism to provide a centralised mechanical service to this sector;

(xii) investigate into the possibility of introducing an insurance scheme under the proposed Small Planters' Welfare Fund to planters involved in the flower sector for protection against cyclones and other natural calamities; and,

(xiii) make provision in the existing Plants Act for the protection of Breeder's Rights.
4. CROP PROTECTION

4.1 Overview

Agricultural pests and diseases are major threats to agricultural production worldwide. Plant protection thus forms an essential integral part of the food production chain. Protecting the country's plant and animal resources from external phytosanitary threats is a national priority in order to safeguard food production and to maintain the disease-free status of the country.

Globalisation and the rapidly accelerating liberalisation of trade are bringing about new challenges in all fields, including plant protection. In the context of WTO, and agreements within COMESA, SADC and the IOC, trade barriers are rapidly crumbling. Delocalisation has made its leadway and the production of crops in the countries of the region will soon be a reality. With improved communication and opening of new markets, movement of people and goods is increasing across the world, which in turn increases the risks of transportation of pests and diseases to regions far from their native areas. All these factors call for greater vigilance from the disease surveillance perspective.

4.2 Challenges

Plant protection measures will therefore need to address these new challenges and manage the risks involved, whilst protecting the country's agriculture and simultaneously facilitating trade. Our challenge will be to establish a rigorous disease surveillance programme which would minimise movement of pests and diseases, reducing their negative impacts, without adversely affecting trade in the field of agriculture. To this effect, adequate pragmatic and sustainable solutions will need to be developed.
While utmost effort will be deployed to protect the country against exotic pests and diseases, it is nevertheless a reality that pests are moving around the world and are invading regions far away from their origin. Action should therefore be directed towards the implementation of a surveillance, eradication and management programme for these pests and diseases in parallel, to exercise better control over their movement and impact.

4.3 Objectives

The objectives of the crop protection sector are:

a. to protect the country’s agricultural economy and ecosystem from introduction of destructive pests and diseases, as a first line of defence;

b. to deliver appropriate transboundary surveillance service to importers and exporters of agricultural produce;

c. to monitor and manage existing and newly introduced pests and diseases;

d. to maintain and improve plant health through modern technologies;

e. to promote biological control as a safer pest control method in an Integrated Pest Management systems;

f. to encourage organic agriculture; and,

g. to encourage agriculture under controlled environment.
4.4 Policy

a. To protect the country's agricultural economy and ecosystem from introduction and establishment of destructive pests and diseases, as a first line of defence

The risk of movement of exotic pests and diseases around the world has always existed and is increasing rapidly due to improved transportation and communication technologies coupled with removal of trade barriers. A sound quarantine system supported by scientific methods is therefore vital in order to address emerging threats. Recent measures taken in this direction include:

(i) the construction of a new quarantine screenhouse at Reduit in an attempt to safeguard the introduction of planting material from foreign sources;

(ii) the installation of a new incinerator at the airport to cater for destruction of an increasing volume of aircraft pantry refuse and other intercepted material of plant origin;

(iii) preparation of appropriate legislation to control movement and use of material of plant origin, e.g. GMO Bill with regard to genetically modified products, and amendments to the Plants Act to cater for new phytosanitary measures as per international conventions.

In line with the above, it is proposed to:

(i) review the quarantine measures and conditions of importation in force presently;

(ii) implement a surveillance system for pests and diseases and encourage use of modern detection methods;
(iii) set up an emergency response mechanism to incursions of exotic pests and diseases and implement control and eradication actions;

(iv) promote quarantine awareness among travel and trading authorities, and the general public;

(v) introduce sampling methods for inspection of incoming commodities;

(vi) establish a list of quarantine pests and regulated non-quarantine pests;

(vii) cater for effective and appropriate soil sterilisation treatments; and,

(viii) reinforce quarantine research.

b. To deliver quality services to importers and exporters of agricultural produce

The country depends largely on the importation of numerous food items. The importation and exportation of agricultural and other goods are nearly always associated with risks of introduction of pests and diseases. Along with protecting our agricultural and other resources, the plant protection sector has the important responsibility of providing facilities so as to allow such processes to be carried out safely. This is achieved through services to stakeholders in response to the provisions of local and international laws governing import and export of agricultural commodities.

The following strategies are therefore recommended:

(i) Further reinforcement of inspection services at ports of entry;

(ii) Creation of a web site giving information on quarantine regulations;
(iii) Introduction of x-ray technology and other detection methods to improve efficiency of inspection; and,

(iv) Setting up of appropriate infrastructure for monitoring of pesticide residues in local fruits and vegetable intended for export, in accordance with international standards.

c. Monitoring and management of existing and newly introduced pests and diseases

Monitoring of pests and diseases is conducted to assess the status of key pests and diseases, their geographical distribution and seasonal variations. It also gives a good indication of the effectiveness of control measures. The monitoring allows the timely detection of any upsurge in the pest status of harmful organisms.

In line with the above, it is proposed to:

(i) set up protocols for monitoring of pests and diseases affecting major crops and forestry;

(ii) take more effective advantage of existing links with regional and international organisations;

(iii) continue the monitoring of fruit flies through trapping and fruit collections;

(iv) monitor introduced biological control agents;

(v) maintain a track record of secondary pests and diseases; and,
(vi) elaborate on control and management techniques for newly introduced pests and diseases.

d. Research towards Maintenance and Improvement of Plant Health

Research into pest control methods is vital for sustaining and developing large scale agricultural production. Mechanisms for the enhancement of food production and food security should be based on sound pre and post-harvest environmentally friendly strategies for pest and disease control. Research efforts need to be reinforced on pest and disease control with emphasis on ecologically sound methods with the implementation of area-wide control programmes.

To this end, it is therefore proposed to:

(i) optimise the use of molecular tools for diagnostic works;

(ii) strengthen research on control of fruit flies and Diamond Back Moth, initiate research on Sterile Insect Technique and conduct feasibility studies on eradication of the main species;

(iii) undertake studies on eradication of melon fly, a key pest of cucurbits;

(iv) adopt alternative quarantine treatments to methyl bromide which will be banned in the near future;
(v) strengthen technical support for proper pest and disease management of nurseries with respect to accurate and timely diagnosis of crop protection problems;

(vi) provide appropriate seed treatment facilities for the planting community;

(vii) make provision for seed health testing and certification within existing legislation;

(viii) identify new varieties of cultivars tolerant to major diseases;

(ix) update on a continuous basis the list of commonly occurring pests and conduct trials on control methods;

(x) update list of stored product pests and conduct trials on quarantine pests and fumigation methods;

(xi) conduct research in nematology; and,

(xii) promote and develop Integrated Pest Management Programmes and establish a pest and disease control programme for organic agriculture.

e. To promote biological control as a safer pest control method

Pest control relies heavily on the use of chemical pesticides that have several undesirable effects on health and the environment. Efforts will be geared towards implementing biological control as part of integrated pest
management programmes. The need to set up a regulatory body in the field is strongly felt.

It is therefore proposed to:

(i) establish appropriate quarantine and additional infrastructural facilities for the proper execution of biological control programmes, including the introduction, testing and rearing of biological control agents and quarantine intercepted material, with high security systems and necessary safeguards based on international standards;

(ii) streamline and update regulations for introduction of biological control agents; and,

(iii) implement biological control programmes, especially in the case of introduced pests, e.g. cypress aphid, spiraling white fly.

Policy with regard to objective (f) that aims at promoting organic agriculture, and, objective (g) that aims at encouraging agriculture under controlled environment are dealt with more explicitly in chapters 9 and 18 respectively.
5. PLANTING MATERIALS

5.1 OVERVIEW

There is increasing pressure towards meeting the requirements for better quality of planting materials due to the marked increase in the demand for food vegetables, fruits and ornamentals. The adequate and timely availability of quality seeds and planting materials is a prerequisite for successful agriculture.

The annual national seed requirement for the major crops is estimated at 16,000 kilograms (excluding bean and potato seeds). The Agricultural Services play a key role in the production of essential inputs for the local planting community in terms of seeds and planting materials including seedlings, grafts, layers and tissue-cultured plantlets. The Ministry of Agriculture produces about 10,000 kilograms annually, which represents around 60% of the country’s needs. Seed production caters for more than 40 locally grown crops species totaling about 90 cultivars. (See Table 4A). The remaining 6000 kilograms is catered for by either the farmers’ own seed production or through importation, mostly of hybrid seeds. (See Table 4B & 4C for imported Vegetable Seeds and other Planting materials).

Figures illustrate that import of hybrid seeds is on an increasing tendency despite relatively higher costs in comparison to locally produced seeds. This is essentially attributed to their higher productivity and good adaptability and also the rising exigencies with respect to quality which urges the planting community to respond accordingly.

Over 50,000 fruit and ornamental plantlets (seedlings, grafts, cuttings, layers and tissue-cultured plant –See Table 4D) are also being produced annually at the local level, primarily by the Agricultural Services and the FARC. As far as production of tobacco seed is concerned, self-sufficiency has been reached with an average annual production of 45 kilograms, the local demand ranging between 30 to 35 kilograms per annum.
Seed potatoes are both produced locally and imported. Local production has increased from 39% of domestic demand in 1997 to 60% in 2000. While in 1997, about 1219 tonnes of potato seeds were imported, this figure stood at 1105 tonnes in the year 2001 (See Table 2G). In the same year, average price of imported seed potato was around Rs 18,000 per tonne whereas price of locally produced seed was Rs 13,000 per tonne.

5.2 Future Targets

Seed quality is determined on the basis of a number of parameters such as storage condition, disease resistance, viability, and purity. To ensure successful crop production, not only good quality of seeds is primordial, but its accessibility and adequate availability are also essential.

The key role of the Agricultural Services in the provision of seeds and other planting materials is indeed vital for the planting community in the actual context. However, the aim now is to restructure this service and gear production of planting materials towards even better quality and ensure its regular availability. It is therefore proposed to firstly have an inventory of the priority items of planting material requirement and accordingly provide the necessary support to meet this requirement. Seed production for export can become a viable activity which can complement export of fresh or processed products. This is achievable in the medium to long-term taking into account the strategic location of Mauritius together with its aim to emerge as a regional nursery for quality planting materials. In line with the above, there is a need to establish a seed certification agency for import and export purposes. The distribution aspect also needs to be given due attention to ensure better accessibility of the planting community to seeds and other planting materials at all times.
The proposed Mauritius Agricultural Biotechnology Institute to be set up would provide a strong research support in the production of better quality seed including hybrid seeds with higher yield benefits at more competitive prices, and may also act as a catalyst for the development of seed production for export.

5.3 Local Seed Production

It is estimated that 15 tonnes of seeds need to be produced annually by the Agricultural Services to meet the demand of the planting community in the coming years.

The aim with respect to seed production is to improve seed quality, increase quantity and improve availability and accessibility of seeds produced.

5.3.1 Policy to improve Seed Production

In light of the above objectives, the following strategies are proposed:

(a) To improve quality of seeds:

(i) encourage local production of high yielding and hybrid seeds to cut down on imports;

(ii) attempt to improve seed viability and remove seed dormancy through proper experimentation;

(iii) investigate into the possibility of seed processing to reduce storage intervals and minimise seed ageing and quality deterioration;
(iv) establish quality parameters and ensure conformity to International Seed Testing Association rules with the establishment of a Seed Certification Agency;

(v) rationalise a pricing system for seeds produced by the Agricultural Services; and,

(vi) reinforce technical assistance to planters on efficient cultivation practices to ensure use of correct seed rate.

(b) **To improve quantity and availability**

(i) improve the production system through:
   - proper training of staff;
   - improvement of existing infrastructure on stations and processing sections; and
   - reinforcement of equipment facility and upgrading of the seed laboratory facility;

(ii) research into improving seed multiplication rate;

(iii) set up a data base on seed demand, available seed stock and sale;

(iv) facilitate importation by the planting community of quality seeds which are not available locally; and,
(v) on the marketing aspect, review the mechanism for pricing, packaging, points of sale and advice to planters.

5.4 Other Planting Materials

This comprises mainly grafts, layers, seedlings and tissue-cultured plantlets. As at to date, the Agricultural Services and the FARC under the umbrella of the Ministry of Agriculture, provide this range of planting material to the planting community. Plant propagation programme undertaken at the experimental stations of the Ministry aims at offering an ‘off-the-shelf’ service to planters and eliminating the waiting list. This service encompasses a range of fruit trees including citrus, mango, litchi, banana, etc., as well as ornamental plants such as tissue-cultured anthuriums, orchids, gerbera, but in a comparatively more limited volume.

5.5 Objective

The overall objective in this sector is to improve fruit and ornamental plant propagation in line with the present reorientation of the diversification strategy to ensure a constant, reliable and adequate supply of high quality planting material for the planting community.

5.6 Policy

It is therefore proposed to:

(i) review and redefine the plant propagation activities of the two existing tissue-culture laboratories at Barkly and FARC, to be able to better respond to our national priorities;
(ii) introduce safely new germplasm of elite varieties of selected items through import from reliable sources, with the forthcoming new quarantine screenhouse;

(iii) use biotechnology for more efficient mass propagation of planting material in demand;

(iv) strengthen the research activities to support plant propagation by establishing links with research institutions, public or private, such as University of Mauritius, AREU, MSIRI and Microlab; and,

(v) make provision for legislation on Intellectual Property Rights and Breeders’ Rights with respect to planting material propagation in conformity with international conventions.
6. PLANT GENETIC RESOURCES (PGR)

6.1 Overview

Mauritius possesses a rich biodiversity comprising both endemic and exotic plant species. Similarly, crop biodiversity consists of wild types and landraces of cultivation which is continuously enriched through import of new cultivars mainly for commercial purposes.

6.2 Role of Institutions

Responsibility for crop biodiversity is presently shared by at least four institutions, the main one being the Agricultural Services through its Plant Genetic Resources Unit for in-situ and ex-situ conservation of germplasm for the agricultural sector. Other institutions include the Agricultural Research & Extension Unit (AREU), the MSIRI and the University of Mauritius.

AREU is involved in conservation of germplasm through maintenance of crops by vegetative means in field collections and through evaluation and use in crop improvement programmes. AREU is also responsible for the introduction of new crops varieties for experimental purposes which are propagated by seeds. The MSIRI is predominantly involved in conservation and utilisation of sugarcane, maize and potato germplasm and the maintenance of a national herbarium. The University of Mauritius is concerned with provision of training and maintenance of a crop museum.

Long-term seed storage falls under the responsibility of the Agricultural Services through the National Plant Genetic Resources Centre at Curepipe Experimental Station. However, storage facilities are still inadequate. This enhances the risk of losing valuable
germplasm especially those wild type varieties which are being replaced by higher yielding and hybrid varieties.

6.3 Conservation of PGR

Conservation work is mostly targeted to rare and endangered species as well as plant items of commercial and economic significance, including those which could be useful in the future within biological control and integrated pest management programmes. Agricultural biodiversity conservation is in fact essential in the present context where it finds itself increasingly threatened both by natural phenomena and human interventions. These include:

(a) introduction of high yielding varieties that may result in genetic erosion for many crops as well as possibilities of hybridisation with local strains as in the case of maize;
(b) destruction of habitats, which may result in a reduction of population size and distribution of wild relatives of crops;
(c) increase in the use of chemicals which may reduce population size and distribution of species; and,
(d) inadequate storage facilities for seeds and lack of equipment facilities for management of accession in the Plant Genetic Resources Unit.

A Field Gene Bank covering an area of 7.5 hectares has been established at Nouvelle Découverte as a means to reinforce the attempts in conservation of plant genetic resources. This gene bank serves for ex-situ collection and conservation of agricultural crops.
6.4 Global Trend

Lately, some issues as regards international free exchange of genetic resources have been increasingly in the limelight. Internationally, there is a growing concern for the protection of farmers’ and breeders’ rights. Since the fight against pests and diseases (which do not recognise man-made boundaries) is no longer one man’s one nation’s concern, international and regional cooperation are very important particularly in the present situation. This is so because crop improvement programmes in almost every country are dependent on exotic germplasm. Realising the need for such cooperation, many countries, including Mauritius, have become signatories of the International Plant Protection Council (IPPC) of the FAO and to regional plant protection agreements such as the IOC and SADC, with the objective of fighting the threat of pests and diseases all over the world.

6.5 Local Status

The absence of such framework in Mauritius regulating Intellectual Property Rights and safe trans-boundary movement of crops will severely limit accessibility to new varieties for crop improvement programmes and to novel crops. The current legislative void also discourages production of new plant cultivars by local plant breeders as well as the emergence of new horticultural and agro-industrial sectors which make use of exotic germplasm.

There is also a policy void regarding the issue of Genetically Modified Organisms (GMOs), in terms of ability and capacity for detection, legislation to protect locally produced commodities and consumer rights as well as minimising harmful consequences to health (human, animal and plants) and the environment.
6.6 Policy

In view of the above, measures will be taken to:

(i) consolidate the existing germplasm of crop plants both exotic and endemic species for crop improvement programmes by:
   (a) renovating existing seed gene banks so as to provide more space for accommodation of the whole national accessions; and
   (b) providing appropriate training to staff involved;

(ii) characterise all newly introduced crop species in the existing collection of germplasm;

(iii) provide for the necessary legal and institutional framework to address deficiencies concerning Plant Genetic Resources;

(iv) provide the necessary legislation to address the issue of Genetically Modified Organisms;

(v) promote long-term conservation of plant genetic resources in gene bank employing ex-situ seed, in vitro cultures and cryo-preservation techniques;

(vi) adequately equip the Plant Genetic Resources unit to make it act as a repository of notified, released varieties, cultivars, parental lines of released hybrids, genetic stocks, and also as a regional repository of duplicate collections of specific crops;

(vii) complement the activities of the Forestry Service and National Parks and Conservation Service and any other department concerned to ensure
availability of exotic and indigenous germplasm through periodic seed
increase for evaluation, utilisation and conservation;

(viii) develop and operate a database and information network system on Plant
Genetic Resources;

(ix) evaluate the genetic drift in old varieties and landraces; and,

(x) conduct research related to medium and long-term conservation of
germlasm of primitive cultivars and landraces of cultivated crops
associated with traditional agriculture and inbred lines of released hybrids.
7. NATURAL BIODIVERSITY

7.1 Overview

In the past, Mauritius used to have a richer biogenetic diversity. However, due to intense deforestation for commercial agricultural development and urbanisation, a large extent of the former forest areas including endemic flora and fauna has been destroyed. Furthermore, introduced invasive species of flora and fauna and pollution from industrial activities have additionally contributed to this biodiversity loss. Part of the island nevertheless still represents one of the most important world heritage of native forest.

The indigenous forests represent only around 2% of the original native vegetation, mainly restricted to the south-west escarpment of the island. This region comprises rather inaccessible areas such as river gorges, mountain slopes and tops. Much of these native forests are subject to heavy pressure from highly proliferous, introduced invasive species of plants and animals. The south-west area of the island is in fact the habitat for most of the remaining threatened birds of Mauritius. It is rated as first among the 75 forests of major importance for threatened birds in the African region in terms of priorities for conservation action by the International Council for Bird Conservation (ICBP).

7.2 Endemic Flora

The country has around 700 species of indigenous plants of which approximately 311 are endemics (found only in Mauritius). Around 40 % of the endemics are threatened by introduced fauna and flora. (See Table 5A for list of identified endangered flowering plants). The World Conservation Union (WCN) rates Mauritius as the third country in the world after Hawaii and the Canary Islands to have the most threatened plant species. A large proportion of the threatened plant species survive as tiny
populations, which poses a very high probability of imminent extinction if no prompt action is envisaged.

7.3 Endemic Fauna

Of the 44 known species of endemic land vertebrates (birds, reptiles, and mammals) that existed in Mauritius and adjacent islands, 21 are extinct including the famous Dodo (*Raphus cucullatus*), the Giant Black Flightless Parrot, and the giant Mauritian tortoise. Eleven native birds, out of which nine are endemic to the island, have escaped extinction.

7.4 Islets Biodiversity

Some of our islets still hold a rich natural heritage. Round Island, one of the 49 offshore islets, is the one that harbours the greatest concentration of native reptile species for Mauritius. It is inhabited by eight species that are all endemic to the Mascarene islands and four species now occur only on Round Island. One of these four species housed on the island, the Round Island Burrowing Boa (*Bolyeria multocarinata*) is probably extinct as it was last seen in 1975. Round Island also supports the last remnant of a palm savannah, once characteristic of the Northern and Western plains of Mauritius. It also still serves as the breeding place for numerous sea birds such as the Herald Petrel, the Red and White-Tailed Tropic Birds and the Wedge-Tailed Shearwater. Serpent Island is a key seabird site, providing the main breeding areas for several species transiting the Mauritian waters. It is also an important habitat for two lizard species.
7.5 Achievements

Substantial progress has been achieved with the implementation of conservation projects, especially under the first Environmental Investment Programme. Owing to the captive breeding programme, followed by release of captive-bred birds, monitoring of population in the wild and control of introduced species at release sites, efforts in saving a number of endemic, threatened bird species have been successful. For instance, the population of Pink Pigeon (*Columba mayeri*) has increased from 25 to 400, that of the Mauritius Kestrel (*Falco punctatus*) from 4 to 700 and the Echo Parakeet (*Psittacula echo*) from 12 to 120.

Some 120 species of the 300 endemic flowering plant species are being propagated *in-situ* at the Native Plant Propagation Centre at Curepipe. Some nine plots referred to as Conservation Management Areas, totaling 44 hectares of native forests have been fenced for *in-situ* conservation work. The fence excludes the introduced deer and pigs, while introduced invasive plant species have been uprooted to favour regeneration of the endemics.

A herbarium has been established at the SSR Botanical Gardens to serve for *ex-situ* collection of most commonly used medicinal plant species. A Plant Genetic Resources Unit has been initiated at the same location to serve as a gene bank for the rich biodiversity housed within the garden.

Four protected areas have been proclaimed by law for Biodiversity Conservation purposes: the Black River Gorges National Park, the Rivulet Terre Rouge Estuary Bird Sanctuary for migratory birds and two Marine Parks at Blue Bay and Balaclava.
A general management plan for our islets has been prepared and three islets namely Gunner’s Quoin, Flat Island and Ilot Gabriel, have been cleaned from animals pests such as rats, hares and rabbits, as part of the implementation programme.

The Wildlife Regulations, the National Parks & Reserves Regulations and the Fisheries & Marine Resources Act 1998 have been promulgated to give added protection to our natural heritage.

7.6 Future Goals

The aim is to reverse the present tendency towards degradation of biodiversity, safeguard and manage in a sustainable manner the biotic wealth of the country, and arouse public awareness on the value and importance of biodiversity.

7.7 Policy

In view of the above, it is proposed to:

(i) strengthen in-situ conservation and promote ex-situ conservation, for both flora and fauna, through plant propagation and extension of protected areas, captive breeding programmes respectively;

(ii) carry out an in depth survey of endangered species of endemic plants and fauna and accordingly work out a rehabilitation programme;
(iii) update national surveys of all biodiversity resources and establish reliable
data base for future implementation and proper monitoring of conservation
and propagation works;

(iv) work out detailed management programmes for each of the three identified
islets;

(iv) promote appropriate biodiversity research through the use of biotechnology;

(v) extend support to stakeholders involved in conservation through training in
project development and implementation thus improving stakeholders' 
opportunity to take a direct role in conservation management;

(vi) consolidate links with regional and international organisations;

(vii) encourage protection of areas identified as rich sources of natural
biodiversity, including wetlands;

(vii) extend captive breeding to other rare species of birds and lizards; and,

(viii) effectively control land based and associated pollution so as to render
estuaries suitable for migratory birds.
8. FORESTRY

8.1 Present Status of Forests

The present total forest area, which covers about 30% of the total land area of Mauritius, is estimated at 57,000 hectares, of which 22,500 hectares are state-owned while the rest is privately owned.

In our small island ecosystem all development needs to be diligently planned with due consideration of the environment and biodiversity so as to maintain an equilibrium between development and conservation.

The native forests represent a wealth of biological resources. The upland forests constitute the catchment areas which are vital in safeguarding the country’s water regime and soil quality.

The planted forests also provide timber, poles and fuel wood for industrial, agricultural and domestic purposes. Currently local timber production stands at 30% of the local need, the rest being imported. Timber production is likely to decline further in the coming years with increasing emphasis being laid on conservation aspect. There is more growing stock (volume of standing timber) in the state-owned forest plantations although more forests are under private ownership.

8.2 Classification of Forest Lands (See Table 5 B)

8.2.1 State Forests Lands

Around 7186 hectares out of the total area of 21,840 hectares forms the National Parks and Natural Reserves, while the rest is utilised for timber, poles,
firewood production as well as for soil and water conservation. Presently the total area under state-owned forest plantations is around 12,529 hectares.

8.2.2 Pas Géométriques

This accounts for around 650 hectares forming a narrow belt of 81.21 metres in width round the coast, and is state-owned. Most of these lands are leased for campement and hotel sites and have thus passed out of forest use.

8.2.3 Privately-Owned Forest Land

These private forests are mostly under scrub vegetation and are exploited mainly for deer ranching and green tourism. Around 6,540 hectares form mountain and river reserves.

8.3 Deer Ranching

Deer ranching is becoming a serious threat to forests. At present there is a backlog of around 150 hectares of clearfelled forest land to be replanted in areas leased for shooting and fishing. Some of these clearfelled areas were previously replanted. The deer population, however, due to scarcity of food, has browsed and destroyed the newly planted pine seedlings. There is therefore an urgent need to restock these areas.
8.4 Forest Legislation

Government has established a legal framework through the enactment of the Forests and Reserves Act (Act 41 of 1983) and the National Parks Act 13 of 1993 to regulate the management of forest resources and wildlife. At the institutional level, the Nature Reserves Board has been strengthened to afford better protection to the native forests.

8.5 Forestry Service

The management of the state-owned forests falls under the responsibility of the Forestry Service of the Ministry of Agriculture.

8.5.1 Forest Policy

The policy of the Forestry Service has been to:

(i) effect the preservation of a tree cover for the maintenance and improvement of the climatic and physical condition of the country, safeguarding water supplies and soil fertility and the prevention of damage to rivers, agricultural land by flooding and erosion;

(ii) effect the permanent preservation as forests of such lands as are required for the perpetuity at reasonable rates of all forests produce required for agricultural, domestic and industrial purposes;

(iii) manage the forest estate with the object of obtaining the highest revenue compatible with sustained yield; and
(iv) **foster** by education a real understanding of the value of forests to the people of Mauritius and assist in every way the owners of private forests, woodlands and plantations to manage such crops in a sound manner.

With increasing emphasis being currently laid worldwide on the sustainable utilisation of biological resources and conservation of natural biodiversity, it is being proposed to review the National Forest Policy to make it more compatible with the Government's long-term vision on sustainable forest management.

### 8.5.2 Activities

In line, with its established policies, the Forestry Service has undertaken the following activities:

(i) Annual reafforestation programme of 150 hectares of state lands and other silvicultural operations like weeding, pruning, leaning etc.;

(ii) National Tree Planting campaign – issue of seedlings of decorative forests species free of charge to Ministries and para-statals bodies;

(iii) Setting-up of the Tree Seed Centre – for collection/processing, storage and documentation of good quality seeds to be ultimately used for production of seedlings for reafforestation and sale to the public;

(iv) Creation of a Conservation Unit to:
   
   (a) propagate very critically endangered native plants;

   (b) plant native ornamental plant species in schools, Governmental institutions and other public compounds.

   (c) create public awareness on the need for conservation of biodiversity.

(v) Rehabilitation of river reserves with forest and fruit trees;
(vi) Studies on native medicinal plants and their eventual propagation; and,
(vii) Initiation of in-situ conservation programmes of the entire habitats of native species of fauna and flora.

8.5.3 Goals

The Forestry Service has set the following annual targets with the view to meeting its objectives:

(i) Reafforestation of 150 hectares of State Forest Lands;
(ii) Production of 800,000 seedlings in Forest Nurseries;
(iii) Weeding of 600 hectares of young plantations;
(iv) Production of about 8,000 m\(^3\) of timber, poles and firewood for the local market;
(v) Preparation of management plans for Nature Reserves;
(vi) Creation of more conservation management areas;
(vii) Rehabilitation of flora along public beaches; and,
(viii) Promotion of public awareness on conservation of biodiversity.

8.6 Challenges of the Forestry Sector

In light of the current situation, the main issues that the forestry sector will have to address, inter alia are as follows:

(i) protection of the strategically located upland forests for soil and water conservation and for protection of the rare native species of fauna and flora;
(i) increasing the production of timber, poles and other forest produce for local market;
(ii) promotion of agro-forestry in a sustainable manner e.g. production of venison, fodder, palm hearts etc., compatible with sustainable forest management policy;

(iii) optimising the use of state-owned forests leased to private operators for deer ranching; and,

(iv) development of eco-tourism as a source of revenue-generation.

8.7 Policy

In view of the present challenges of the sector, Government proposes to:

(i) hire the services of a Forest Policy Expert who will have the responsibility of:

a. reviewing the existing forest policy and highlighting its inadequacy to address the long term vision of sustainable forest management;

b. identifying new issues which have emerged in the sector over the last decades and which are not properly spelt out in the existing policy;

c. discussing the plausible means of addressing these emerging issues with all stakeholders concerned, including relevant Government authorities, deer ranchers, eco-tourism promoters, Non-Government Organisations, Mauritius Wildlife Foundation and any other relevant parties; and accordingly,

d. advising on the drafting and finalisation of the revised Forest policy.

(ii) make a comprehensive inventory of forest resources and thereafter undertake an evaluation especially of those lands leased for deer ranching;
(iii) foster sustainable utilisation of forest resources through research, agro-forestry, eco-tourism and safe recreational activities along with appropriate conservation measures;

(iv) promote eco-tourism as a revenue generation activity;

(v) provide recreational facilities to the public through the creation of trails and construction of kiosks, benches and tables at appropriate areas in forests;

(vi) promote the application of modern technologies in the propagation of medicinal plants;

(vii) work out reafforestation programmes with the appropriate species to be grown for hill slopes and mountains which are severely eroded and regularly subject to bush fires;

(viii) reinforce research efforts into improvement of quality of seeds and planting materials for increased timber yield;

(ix) introduce improved techniques for the conservation and propagation of endangered indigenous species of flora;

(x) ensure the creation of Conservation Management Areas;

(xi) amend Forest and Reserves Act 1983 with a view to giving more protection to forest resources as a valuable asset; and,

(xii) strengthen local institutions for conservation and consolidate international cooperation.
9. ORGANIC AGRICULTURE

9.1 Overview

Organic agriculture refers to methods of growing and processing food that rely on the earth’s natural resources. Pests and weeds are managed using earth-friendly means such as beneficial insects, biological and mechanical controls. **Organic farming makes optimal use of natural nutrients in soil which help fertilise plants without reliance on synthetic fertilizers.**

Organic foods are gaining momentum throughout the world, particularly in Europe and the USA. **Organically produced foods fetch higher prices than conventionally produced ones, but the advantages and benefits accruing from them are increasingly favoring their acceptance.**

9.2 Benefits of Organic Agriculture

The main benefits of organic agriculture can be summarised as follows:

(i) reduced input costs;
(ii) building soil quality;
(iii) increasing food safety and having lesser damaging impacts on the environment by decreasing chemical use;
(iv) better tasting and enhanced quality of foods; and
(v) reduced pest, weed and disease incidence that usually accompany mono-cropping.
9.3 Local Status

Organic farming is a very new concept for Mauritius although worldwide, farmers are giving much attention to environment friendly agricultural practices. The need is more felt now with the implementation of stringent norms on the issue of food safety and pesticide residue content. With the implementation of the zero pesticide residue regulations in the European Union, Mauritius will be forced to review its current agricultural practice which is often based on an excessive and improperly planned use of chemicals. Too much emphasis is being laid on rapid production and on the aesthetic aspect of the final produce that quality is often being disregarded.

The market for organic produce is bound to grow along with the increasing awareness of markets of health issues and environment friendly habits. Mauritius has to plan ahead for a rather drastic change in farming practices if it is to anticipate exporting food commodities in the future, especially towards the EU countries.

9.4 Policy

It is felt that organic agriculture in Mauritius has to take the form of a stepwise process. There has been in the past several attempts to encourage organic farming, however the approach has never proved too successful. After discussions with various stakeholders involved in the agricultural sector on this issue, the following observations and recommendations are proposed regarding the production, legislation and marketing aspects of organic farming that need to be addressed.

9.4.1 Production

Regarding Production, it is observed that, due to land scarcity, it would be difficult to set up organic farms in the vicinity of fields with conventional farming due to risks of contamination by draft.
With a view to encouraging organic farming, it is recommended that:

(i) appropriate sites for organic agriculture, both locally and regionally, be identified;

(ii) cultural methods for organic production be established and appropriate training be imparted to interested planters in this respect;

(iii) special start-up incentives be provided to assist interested growers in investing into organic agriculture;

(iv) means be devised to encourage the use of locally available organic fertilisers such as cow and chicken manure, sugar cane by-products and municipal wastes etc., to boost up soil organic matter and structure;

(v) farm scale composting units be set up to process domestic wastes;

(vi) the use of natural products be encouraged as substitutes for synthetic pesticides and herbicides;

(vii) a certification system agency be set up within the Ministry of Agriculture based on local norms with an inspectorate unit for organic produce; and,

(viii) research initiatives on organic farming be reinforced by the University of Mauritius, AREU and the Mauritius Research Council.
9.4.2 Legislation

Organic farming also demands the appropriate legal framework and support in order to operate within the required norms. To this effect, it is proposed that:

(i) an appropriate legislation be established to define national standards for organic production and to allow legitimate marketing of organic produce;

(ii) a regulatory body be created under the aegis of this Ministry to regulate all procedures with respect to the evaluation of proposals and inspection of premises to ensure conformity with international standards, issue of certificates and training of staff; and,

(iii) the proposed certification agency be accredited with a national seal for recognition of the Mauritian label to ensure reliability of produce especially at international market level.

9.4.3 Marketing

Whilst encouraging organic agriculture within the planting community, it becomes imperative to ensure marketability of the produce, which normally entertain higher value. In this respect, it is proposed to:

(i) make an inventory of demands and consumer tendencies at the local level;
(ii) create a database on market demand, value and tendencies for organic produce at the regional level and international level for potential interested planters;

(iii) sensitise planters on bio-farming; and,

(iv) initiate awareness campaigns on safer food habits and benefits of organic produce whilst encouraging organic production.
10. LIVESTOCK SECTOR

10.1 Present Status

In 2000, Mauritius produced 2% of its beef, 3% of its goat and sheep meat, and 5% of its milk requirements. Production of pork stood at 73% of our domestic demand, whereas that of the processed meat at only 14%. Mauritius is, however, self-sufficient in chicken meat and eggs. Venison production has stagnated at around 500 tonnes annually (See Table 1E).

Government has been providing several support measures to this sector at large for years, such as provision of improved breeds of certain farm animals at subsidised rates to the farming community, subsidy on livestock feeds and various other forms of incentives coupled with strong technical and extension services. With a view to assisting farmers, Government is also heavily subsidising the slaughter fee for the service provided at the central abattoir at a rate of Rs 7.28/kg, while the actual cost stands at Rs 24/kg. Despite these numerous incentives to the local livestock sector, returns on investment (except for poultry meat and eggs) has remained generally low, if not insignificant. As a result, import in this sector has known a characteristic increasing trend in general (See Table 5C).

10.2 Constraints to the Sector

This sector is faced with a number of socio-economic and environmental constraints which have hampered major leaps from traditional livestock rearing to modern farming systems.
The **limited availability of land** and a generally **low cost-efficiency** are also major constraints to extensive livestock rearing. These impart a comparative disadvantage to Mauritius in developing large scale farming activities.

**Seasonal scarcity of fodder and grass** has also been an important undermining factor to the livestock sector. With no existing provision for conservation of fodder during periods of excessive availability, the frequent exposure of the country to periodic droughts has seriously inflicted on the health of grazing farm animals.

New external threats are now arising with **trade liberalisation** regionally and internationally. This results into a situation whereby the local livestock sector finds itself more vulnerable being unable to compete with imports of live animals for slaughter from neighbouring countries like Zimbabwe and South Africa with much lower cost of production.

Another main problem is the **availability of raw material for local feed manufacture**, most of which is imported at present. Mauritius imports all of its annual requirement of maize which stands at 60,000 tonnes, out of which about 30% comes from the region. The feed manufacture industry also imports cotton seed cake, soya bean meal and wheat bran among others as primary inputs. **Price** of feed ingredients and their **availability frequency** are also other constraining factors to the feed manufacture industry that directly impact on the livestock sector. The production of livestock feeds at the Richelieu Government Livestock Feed Factory stood at 6315.1 tonnes for the year 2001 (See Table 5D). With a view to encouraging farmers to stay in business, Government provides a subsidy of Rs 1500 per tonne on cattle feed, cotton seed cake, pig feed, rabbit feed and mineral mixture. A sum of around Rs 9 million is budgeted each year in this regard.

Intensive livestock production in residential and urban areas is today subject to **strict environmental norms and legislation**. Entrepreneurs are often unable to comply with the above and find it almost impossible to shift their activities to other suitable areas.
The future of the sector may lie in the development of value-added livestock products. In this respect, the clean animal disease picture of the country and the level of technology available in the meat and fish agro-processing sector will assume an increasingly important role in the emerging livestock agro-industry.

10.3 Recent measures

In view of the current situation and the declining interest within the sector, the Ministry of Agriculture has taken certain measures to review the general set up and organisation within the livestock sector with a view to streamlining its activities and focusing only on the main requirements. Along this line, in view of the fact that demand for breeding stock of animals has largely decreased, action is being initiated to centralise all livestock activities at the Palmar Livestock Breeding Station. Sheep production has been ceased at Salazie and the existing stock has been sold to local breeders and transferred to Rodrigues. Only a small nucleus has been retained to maintain a genetic stock. It is also proposed to close the Richelieu Livestock Station.

10.4 Subsectors

10.4.1 Chicken Meat & Egg Production

The chicken subsector has witnessed sustained investment from both the large and small producers. The Agricultural Services, through the Poultry Breeding Centre, has played a pioneering role to set the foundation of a modern poultry industry, which has helped the private sector to take off.
Mauritius is now self-sufficient in chicken meat and eggs. Meat production stood at 5750 tonnes in 1980 and increased consistently over the years to reach 27,200 tonnes in 2001 (See Table 1E). Similarly, egg production increased from 4000 tonnes in 1980 to reach 12,000 tonnes in 2000. The private operators now provide a package of incentives to interested small breeders such as chicks for contract growing and guaranteed market for final products. As this subsector is not land demanding, private investments have been continuous and relatively larger operations have benefited from Agricultural Development Certificates. These commercial units source their chicks from a few large private producers who have entered the market and established themselves with the latest technologies available.

The present role of the Ministry through the Agricultural Services in supplying chicks to the farming community has now become a marginal contribution to the sector to the tune of 5% of the total poultry production. As the role of the private sector becomes increasingly prominent, the Ministry's longer term objective should be a disengagement from day old chick importation and production to that of a provider of regulatory and technical services.

While marketing of chicken products arising from large producers has known a relative modernisation through value-addition and sale to supermarkets, hotels and restaurants, the marketing side of small-scale production has remained traditional. This is often attributed to lack of sufficient hygiene in standards of sales and insufficient planning for disposal of production.

Another issue of concern is the scarcity of domestic resources for feed manufacture, thus compelling the feed industry to rely on imported raw material. This entails the problem of security of supply and of price fluctuations of these key inputs. Trade liberalisation, further threatens the competitiveness of the chicken subsector which is presently well-protected by trade barriers. There will therefore be
an increasing need to restructure this subsector to enable it to face the possible adverse impacts brought about by liberalisation of trade.

Although the chicken agro-processing industry has taken off positively, it is felt that development within this sector has been somehow hindered due to the absence of adequate analytical facilities at the local level. In the present context whereby conformity to norms on quality and food safety is of major concern, companies involved in chicken agro-processing (like any other agro-processing activity at large) are compelled to resort to foreign services which is not only costly but also time consuming. The need for such services at the local level is increasingly felt, especially within the chicken sector where there prevails a general public concern about unhealthy practices at the production level purely for commercial benefits.

Taking into consideration the above, it is proposed to:

(i) clarify institutional and different agency roles with a view to ensuring enforcement of quality and food safety norms and regulations;

(ii) ensure compliance to hygienic and safety norms at the production, processing and distribution levels in collaboration with the enforcement authority (Ministry of Health);

(iii) investigate into the possibility of setting-up a waste disposal and waste management programme for the poultry sector in collaboration with the authorities concerned;

(iv) organise training courses for small farmers on modern poultry farm management practices;

(v) provide technical facilities for poultry breeders for early detection of diseases;
(vi) reinforce research and development within the sector particularly in the fields of pathology, processing and vaccine development against common local diseases;

(vii) provide analytical and technical facilities under the proposed Food Technology Laboratory to the chicken agro-processing enterprises for quality and safety assurance at the production, processing and distribution levels;

(viii) review the mechanism of issue of permits to new entrants in tune with the production volume and marketability; and,

(ix) look into the possibility of promoting production of maize and other raw materials in Rodrigues and in the region to support the local feed manufacture industry.

10.4.2 Duck Rearing

The duck is a poultry species which has received very little attention in the local livestock production sector. Duck meat consumption is low. The only major producer is a subsidiary company of the Food & Allied Ltd which produces some 2000 ducklings per week for fattening purposes. Annual local production is estimated at around 250 tonnes. It is noted that ducks can make efficient use of certain feed resources which are less efficiently converted by other poultry species.

With a view to studying the prospects of duck rearing as an economic activity in Mauritius, a pilot project has been initiated through the technical assistance of Chinese experts under the Chinese Technical Assistance Programme. The project, which is a
first initiative of this kind, constitutes the establishment of a Duck Breeding Farm at Albion. The main objectives of the farm will be:

(i) to develop high yielding meat strains by selective breeding;

(ii) to supply improved quality Muscovy and Peking ducklings to the farming community;

(iii) to serve as a center for technical advice and training in duck production and management; and,

(iv) to conduct research on duck nutrition.

Presently, the appropriate infrastructure required is being put in place. A rearing unit has been constructed and an isolation chamber, pond and other infrastructural requirements are being completed. The farm will be equipped with a small hatchery and, once fully operational, it will target a production capacity of around 500 day-old ducklings weekly.

With a view to providing improved local breeds of ducks, ducklings are currently being purchased from various localities and sources around the island for breeding purposes. Emphasis is also being laid on the conservation aspect of the local breeds, in particular the Canard Manille and the local Peking Duck, with the creation of a gene bank at the Palmar Livestock Station where genetic resources of all indigenous species of farm animals would be conserved.

Results of this pilot project will provide useful indications as to the feasibility of developing duck rearing into a potential economic activity like the poultry sector.
10.4.3 Beef production

The annual requirement for fresh beef meat is about 2600 tonnes. It has been observed that the contribution of locally-produced beef to the needs of the country has been declining steadily over the years. In 2000, local production represented only 2% of total fresh beef meat consumption. Activities within this subsector once constituted of importation of breeds either for calving or for fattening, and while the former became unprofitable over time, the latter continued to remain viable.

The Ministry of Agriculture has been allowing importation of weaners for fattening. However, since the liberalisation of cattle imports, the tendency at the local level has been more towards the import of ready-to-slaughter live animals instead of weaners for fattening purposes. Limited land availability for intensive commercial farming, the low cost-efficiency generally associated with the activity, coupled with our increased exposure to foreign competitors with a greater production potential (in terms of volume and cost), have altogether contributed to the continuous decline being experienced within the subsector at the local level. As a result, many major operators in the sector have gradually either moved out of business or have reduced their herds substantially. However, with increasing concern on food security, there is more reason to preserve a nucleus stock of beef cattle.

In regard of the above, it is proposed to

(i) review the services provided at the central abattoir more specifically the weighing mechanism with a view to gaining suppliers’ confidence;

(ii) adopt a more flexible approach in the process of issue of permits to bona fide breeders for import of weaners for fattening whilst at the same time ensuring compliance to quarantine norms;
(iii) maintain at all times a strategic stock at national level;

(iv) modernise the existing abattoir for beef slaughter at the Mauritius Meat Authority to ensure compliance with quality and safety norms, and also ensure that such norms are adhered to especially at the points of sale; and,

(v) strengthen Veterinary Services to provide a better and rapid service to minimise losses at breeders' level.

10.4.4 Goat meat production

Goat meat production has been characteristically operated as a backyard activity with a minimal level of organisation and input in extensive systems. Yet, the opportunities and demand for goat meat has always been existent.

Goat production has followed the same declining trend as cattle, and the goat population has decreased from around 73,000 heads in 1988 to around 14,000 in 1999 (See table 5E). Local production accounted for around 43% of consumption in 2000.

Rearing of goats has however so far not met with a reasonable degree of success, although goat meat is well appreciated in Mauritius. It is mostly undertaken as a side activity with only few breeding herds reaching 50 heads. Most units have between 5 to 15 heads. One major inherent constraint to development within this subsector has been the high degree of risk of in-breeding, which severely lowers productivity.
In order to assess the situation in goat production in Mauritius, an expert was deputed by the Government of India. The study undertaken showed that there has been a gradual shift from cattle breeding to goat keeping over the years. The main reasons given were similarities in husbandry practices and comparatively lesser input required in terms of attention, fodder, space and investment. However, goats by virtue of their size and reproductive efficiency have biological as well as physical advantages over other farm animals with greater adaptability to extreme climatic and topological conditions. Goat rearing therefore stands a better chance of success than other farm animals. Also, with the present consumer tendency towards leaner meat, goat meat generally having low fat content would be appropriate.

However, the introduction of the Boer goat, a hardy animal with good meat characteristics, has revived goat farming to a certain extent, such that presently the local demand for that breed cannot be met. There has been a slight increase in locally-produced goat meat from 66 tonnes in 1994 to 150 tonnes in 2000, while imports of frozen and live animals have remained high, at 5350 tonnes of meat equivalent in 2000.

Attempts for large-scale goat farming have often not been successful owing to numerous factors other than in-breeding such as disease problems, and availability of fodder and grass. This subsector has, as a result, remained traditional with insufficient organisation and management both at production and marketing levels.

In light of the above, it seems that the goat meat subsector should be encouraged to become more viable by designing a participatory approach that will involve elite farmers.
In light of the current situation within this subsector, it is proposed to:

(i) set up a pilot project for imports and adaptation of appropriate goat breeds for future breeding programmes with the aim of eventually constituting multiplier farms;

(ii) encourage research in breeding programmes for environment tolerance and adaptability as well as disease resistance and better meat quality;

(iii) ensure a regular supply of goat of superior breeds to interested breeders at the breeding stations of the Ministry of Agriculture;

(iv) sensitise breeders on the advantages of promising superior breeds and their availability at the breeding stations of the Ministry of Agriculture;

(v) create an enabling environment for a more professional approach by farmers and marketing agents; and,

(vi) reinforce research into means of conservation of fodder and grass to cater for periods of scarcity.

10.4.5 Pork production

Pork production involves some 300 primary producers, 25 registered butchers at the Roche Bois Central Abattoir, and 4 to 5 processing plants which import choice cuts for transformation. It is estimated that the primary breeders are mainly backyard and part-time producers and they are scattered in the rural and coastal regions. There are about 10 to 12 large-scale production units that produce about one-third of total domestic production. Due to sanitary and environmental pressures, the pig industry is slowly evolving from a low-input system with many small breeders to a more intensive system with a fewer number of larger breeders.
Local production was nearly 1,100 tonnes in 1994, but fell to 712 tonnes in 1999. In 2000, there has been a slight reversal, with production standing at 891 tonnes representing 73% of domestic supply. In 1994, at least 510 tonnes of processed pork was imported, which increased to 350 tonnes of raw materials and 1300 tonnes of finished products in 2000. Local production of processed meat has not known the desired expansion, decreasing from 190 tonnes in 1994 to only 145 tonnes in 2000.

Present prices obtained by small producers reflect the relative market saturation of second quality product. The production system of small farmers does not generally yield the quality lean meat expected by top market clients such as hotels, supermarkets and processors. A significant amount of choice cuts and processed pig meat products are still being imported. Processing plants would normally be agreeable to use locally-produced raw materials given the necessary standards in quality, quantity and price. Moreover, it is held that the future of local pig keepers will closely depend on the uniform production of quality raw materials at competitive prices for the processing plants.

The main production problems of pig producers are poor pig health and piglet mortality, a reliable supply of piglets as well as better nutrition to improve carcass quality. There is also an important issue of the impact of pig rearing on the environment and that of waste management. Further increase in production will therefore have to cater for environmental concerns.

Currently, the local pig industry largely relies on the use of industrial by-products and food remnants from hotels, processing plants and households. Meat produced has, therefore, remained of inferior quality. As explained above, the survival of the industry will depend on better quality meat production for supplying the fresh market and processing plants. Better quality meat implies better feed to capitalise on the high feed conversion efficiency of this animal. Besides, the use of industrial by-products and food remnants as feed may constitute a hazard to food safety while increasing the risk of disease outbreaks.
In view of the fact that over the years, pig rearing has been primarily a localised activity, carried out in specific areas of the country, and that its expansion had not been planned in account of the required parameters, a number of environmental and sanitary issues have been triggered as a result. The objective is now to review the whole subsector so as to devise means to best accommodate this activity in the actual context, whereby food safety and environmental concerns are being increasingly raised.

Two relocation programmes, at St Martin in the West and Bassin Requin in the East, have received Government support, and presently, attention is being given to waste treatment and disposal to reduce the serious environmental nuisances being encountered at these two sites. In this context, a pig-waste treatment plant is being constructed at St-Martin and works will be completed in April 2003. With respect to Bassin-Requin, a waste treatment plant is already operational. A training programme is envisaged with a view to familiarising pig breeders on the efficient use of the treatment plants. As regards pig breeders of Roche-Bois, a technical committee has been set up at the level of the Ministry to propose remedial actions concerning specific problems faced in that locality. Concerning disposal of sludge, a Technical Advisory Committee is looking after this issue. With the proper implementation of these projects, it is expected that pig rearing will be viewed with a more professional approach.

Integrated farming systems has been proposed by the farming community as an alternative to address environmental issues while making production cost-efficient and viable. Restructuring of the marketing system in line with production has to be looked into, especially concerning production of choice cuts and supply to processing plants.

It is therefore proposed to

(i) study the applicability of integrated farming systems in the local context;
(ii) foster research and strengthen extension on pig husbandry and study the need for introducing new genetic material; and,
(iii) encourage restructuring of the marketing system in line with production.
10.4.6 Production of Venison and its By-Products

Venison is currently the main domestic red meat sector and is the only meat other than poultry, which is consumed by all components of the population.

Over the past 25 years, the deer industry has gradually been shifting from a game activity towards a semi-intensive livestock enterprise. However, it has been noted that there has been no significant shifting in favour of the feedlot system. The current land occupation under the extensive system is around 25,000 hectares of marginal and forest lands – with around 15,000 hectares of private land and 10,000 hectares of leased state forest lands. This makes up a total of 40 ‘chassées' on privately-owned land and 34 on state-owned land. The feedlot system comprises an area of around 1200 hectares only. Of the estimated 70,000 deer heads, about 80% are reared in the extensive system.

Production which stood at around 240 tonnes in 1980, has been stagnating at around 450 tonnes over the past ten years. The current annual production from ‘chassées' (extensive farms) during the hunting season is of the order of 400 tonnes. As far as production in feedlots is concerned, it stands at around 75 tonnes annually. Being a seasonal commodity, the price of venison on the local market has however remained relatively high.

The present average stocking density is one head per acre on state lands and three heads or more per acre on private lands. There have been several representations by lessees of the Shooting and Fishing leases to increase their allowable pasture allocation from 5% to 15% of the leased areas with a view to increasing productivity per hectare. However, environmental considerations, in particular, the high risk of destruction of forest plantation by the deer population, have been a major concern of Government in allowing such development.
Stomoxys fly, a major pest, remains a major threat in certain areas and effective control measures are required. Poaching is also becoming an acute problem for lessees with more and more incidence of this kind being registered and law enforcement in remote forest areas is difficult.

Presently, certain leased state lands under extensive deer rearing are overstocked and represent a threat to the forest plantation. Furthermore with the present development trends, extensive systems will also have to compete increasingly with other economic activities that are more environmentally sustainable and profitable in terms of use of land. In view of all the above, coupled with the pressing land scarcity that the agricultural sector, as a whole, finds itself increasingly confronted to, the desired development of the venison subsector would be towards the use of intensive production systems. However, it should be noted that the intensive system has so far not yielded the expected results.

Currently the totality of venison produced during the hunting season and put at public sale are not subject to veterinary inspection. In practice, the carcasses are usually eviscerated at the ‘lieu de partage’ in the ‘chassées’ and subsequently directly sold to butchers. As a result, the fitness of the venison so disposed of, for domestic consumption is not officially ensured. In this respect, with a view to ensuring consumer safety, it is essential to set up a mechanism to regulate the quality of meat generated from game activity.

Despite the numerous constraints, the venison subsector holds enormous promises. Venison, being an exotic meat, has big market potential both locally and abroad. Furthermore, the quality of the local meat has been found to be superior to venison from temperate deer species, which gives an added advantage to explore export avenues. In the past, Mauritius used to export venison mainly to Reunion
island and Malaysia. However, this activity was severely hampered by increasingly stringent international norms regulating food quality and safety coming into force, and eventually had to be ceased due to our inability to effectively satisfy the required standards.

In order to be in a position to relaunch the export activity, it is imperative to set up the necessary framework to ensure that the norms are correctly adhered to. In this respect, the appropriate infrastructure for slaughtering to be done under the required phytosanitary conditions in conformity with export norms must be established. Along the same line, the proposed Food Technology Laboratory will play a complementary regulatory role in providing the necessary analytical facility for quality assurance, with a view to ensuring strict compliance to international norms and gaining the confidence of the prospective importers.

In order to reap optimal economic benefits at the markets, it is also proposed to encourage value-addition to the meat prior to its commercialisation. Means of fully exploiting the commercial value of the by-products of venison should also be studied. By-products including skin, hide and antlers have numerous artisanal, decorative and other uses which need to be optimised upon.

In view of the above, it is proposed to:

(i) carry out a study to determine the prospects for expansion in this subsector with particular emphasis on increase in production under the feedlot system, the use of modern methods of nutrition and breeding, value-addition and marketing prospects;

(ii) determine the optimum deer population density on leased state owned forests lands in as far as it is compatible with sustainable forestry;
(iii) reinforce research and development to promote intensive farming;

(iv) introduce legislation to ensure compliance to norms with regard to food quality and safety at all levels in the subsector from production to marketing;

(v) ensure a close monitoring of feedlots by qualified veterinarians to ensure compliance to standards, requiring regular reports on the state of health of animals to be sent to the Division of Veterinary Services of the Ministry;

(vi) ensure that carcasses produced on feedlots are transported to the central abattoir in conformity with hygienic and safety norms, in properly closed and ventilated containers and suspended in hooks overhead rails avoiding spillage on the floor;

(vii) upgrade the slaughter hall in the goat section in the context of the proposed modernisation of the central abattoir, according to international norms to receive live deer for slaughter from feedlots, and alongside set up special holding pens for the temporary housing of these live animals;

(viii) ensure the setting-up of on-site 'Inspection Houses' on chassées, in strict compliance with norms and standards to serve for the dressing and inspection of carcasses by certified veterinary officers, with a view to ensuring a better control over quality and safety of meat produced from extensive systems;
(ix) ensure that only carcasses found fit for consumption are given unique reference and are delivered with an inspection certificate by the certifying veterinary officer, and bear a stamp of the abattoir prior to disposing for sale;

(x) ensure that regular checking of the ‘Inspection Houses’ is carried out by the Veterinary Services or qualified officers licensed by the Veterinary Services;

(xi) ensure that proper facilities and control mechanism are set up on ‘chassées’ for the disposal of carcasses found unfit for consumption;

(xii) ensure that daily reports of sales and seizures (along with relevant samples in this case) be sent to the Veterinary Services and the Chief Health Inspector by all ‘chassées’; and,

(xiii) strengthen legislation with a view to imposing more severe penalties with regard to poaching.

10.4.7. Dairy cattle

The dairy sector has been largely dominated by traditional backyard producers and has been characterised by low input and poor productivity. Only a few professional dairy farmers have entered the sector and their contribution is marginal. The dairy cattle population has been on the decline with the present national herd estimated at around 5000 heads and local milk production accounting for 5% of domestic requirements.

A pilot milk marketing scheme was set up in 1986 and managed by the Agricultural Marketing Board (AMB) with a view to assist cowkeepers in the marketing
of their milk. This scheme, as at to date, involves only 425 farmers of the estimated 2500 and collects about 2600 litres of milk daily of a total production of 10,900 litres. The sector is however constrained by quality and market factors as well as increasing cost of production. Limited land availability to further intensify cattle rearing activity for production of milk coupled with seasonal scarcity of fodder and grass are additional constraining factors.

Research has been initiated into investigating potential means to increase milk production in smallholder dairy cows. The project comprised the monitoring of the reproductive status of some 500 dairy cattle by determining the progesterone hormone level using advanced molecular techniques. The objective is to use the findings to devise means to improve the efficiency of artificial insemination.

Government has attempted to support the small cowkeepers through various direct and indirect subsidies amounting to an annual outlay of nearly Rs 25 million. Formerly, Government had also been importing dairy cattle for distribution to small cowkeepers at cost price but support to this subsector has not brought the desired results, the initial set target being to attain 40 % of domestic fresh milk demand. Attempts by Government to group small cowkeepers into cooperatives for the better pooling of effort and resources have not yielded the desired results. Also, with a change in the socio-economic environment, there is a more pronounced erosion of interest in the subsector. Meanwhile, import of UHT milk has been increasing steadily.

In view of the exorbitant imports in the milk subsector standing at nearly Rs 1 billion in the year 2001, Government is aiming at optimising on the current local milk production by bringing in desired quality value. In this respect, Government, through the Ministry of Commerce & Cooperatives, is setting up a Dairy Plant, in collaboration with the Federation of Small Cowkeepers. This project, which is being conceived as a privately owned business enterprise, will be phased. At an initial stage, the Dairy Plant will provide a pasteurisation service and will eventually expand its activities to provide a
range of value-addition services. Its objective is to provide a processing service to cowkeepers with a view to giving added shelf-life to milk produced at farmers’ level and hence enhancing the marketability. Such an enterprise would give a new boost to local cowkeepers, who have often been discouraged to stay in business due to the acute marketing difficulty and poor prices fetched on their produce. This facility will also be used to process milk produced at Government stations under the Ministry of Agriculture with a view to minimising wastage.

In light of the above situation, it is proposed to:

(i) extend and maintain the facility currently provided to small cowkeepers with regard to the marketing of their milk, in the context of the review and redynamisation of the sale of milk by the AMB;

(ii) review the pricing mechanism currently applied by the Ministry of Agriculture for sale of milk;

(iii) review loan schemes presently provided by the Development Bank of Mauritius to encourage new entrants in the subsector; and,

(iv) work out a collaborative work programme between the AMB and the proposed Dairy Plant, once it becomes operational, with a view to promoting value-addition to locally produced milk.
10.5 Future of the Livestock Sector

It is a well known fact that the considerable changes in the international trade environment is likely to bring about a large impact on the local livestock sector. Issues that are emerging with the trade liberalisation process will need to be addressed in a regional, as well as, an international context. With the world becoming a global village, and the creation of regional blocks to capitalise on trade opportunities, it will not be possible for Mauritius to operate in isolation. Instead, a critical strategy will be required that would allow us to address the emerging issues in a judicious manner and safeguard our interests as far as possible.

To this effect, it is proposed to set up a public/private sector joint committee that would have the responsibility of devising the appropriate strategy for the local livestock sector.
10.6 Animal Health

Up to now, Mauritius has been free from the major animal diseases that plague livestock production in Africa, Asia and Europe. Of the important animal diseases classified in List A of the Office Internationale des Epizooties, only three namely Newcastle Disease, Lumpy Skin Disease and Classical Swine Fever have been recorded in Mauritius. All three diseases, however, are being kept under reasonable control through vaccination and correct hygienic practices. Their economic effect has therefore remained minimal, except for some time-bound and location-specific outbreaks.

But, a main disease affecting the poultry industry is the Infectious Bursal Disease which causes economic losses exceeding 100 million rupees annually. There is a need to improve the sanitary standards of production and marketing in order to minimise risks of disease outbreaks and ensure security of investment in the subsector. The area of meat sale generally lacks adequate inspection in terms of application of hygienic standards. There is a void in terms of quality norms and legislation concerning slaughter of poultry especially by small private concerns.

It is also imperative to ensure that slaughter of all live animals for consumption is performed according to hygienic norms to ensure food safety. Slaughtering at the central abattoir in this respect, not only plays an important role in the protection of consumers but also provides a means of tracing the source of infected animals for remedial action. Furthermore, the area of disease surveillance needs strengthening especially at small breeder level.

Government has been giving several free support services to breeders, namely artificial insemination, veterinary services including diagnosis, and provision and administration of vaccines.
As far as the area of animal welfare is concerned, there has been a vacuum concerning norms and legislation both at production and marketing levels. There is growing consumer consciousness both nationally and internationally on this issue.

**Control against introduction of pest and disease through the rising imports of livestock and their products must also be strengthened.** This would imply more effective inspection and enforcement of existing legislation.

In regard of the above, it is proposed to:

(i) improve pest and disease surveillance and management through effective control at ports of entry, the setting up of analytical capacity and appropriate enforcement agencies that will act at production and marketing levels;

(ii) implement strict measures to combat illegal slaughtering;

(iii) provide adequate training to officers responsible for the inspection of meat to ensure consumer safety;

(iv) strengthen research initiatives on the production of vaccines against recurrent diseases inflicting the local livestock sector e.g. Infectious Bursal Disease and Newcastle in poultry; and,

(v) provide appropriate legislation and enforcement regarding animal welfare and meat safety.
10.7 Farm Animal Genetic Resources

Farm animals introduced in Mauritius over the past two centuries have adapted themselves to the agroclimate and have become tolerant to epidemics of the country as well as to relatively low levels of nutrition. But, these animals being generally of low productivity have been systematically discriminated against over the last few decades by the introduction of new breeds selected and developed in other countries. **There has, consequently, been a slow elimination of the old breeds due to lack of awareness, interest and certain financial considerations.**

**Urgent measures to salvage and safeguard remaining resources is a priority for countries involved in animal genetic research and breeding.** Unfortunately due to the high costs of research, the country has had a tendency to rely on imported genetic resources rather than investing in breeding strategies that would utilise local stock. However, this could be possible in a regional context through a network of collaboration.

Work concerning farm animal genetic conservation has recently started through the Agricultural Research and Extension Unit (AREU) and concerns those animals which can be farmed and have a special niche in Mauritius. These are the Russa Deer and the landraces of domestic animals that is the Creole Cattle, the Barbari Goat, the Rodriguan Black Head Sheep, the Mongoose Pig, the Mauritian Backyard Poultry and the Rodriguan Poultry, rabbit, the Manille and Peking Ducks. These local breeds are highly efficient feed converters, disease resistant, and may also have niche markets. Conservation of the Creole Cattle has already started at the Curepipe Livestock Research Station and animals are being bought from small farmers to create a gene bank.

With regard to the above, it is proposed to:
(i) make an inventory of existing animal genetic resources focusing on major livestock species such as cattle, goat, sheep, pig and poultry in order to identify breeds at risk of extinction;

(ii) take measures to:
   (a) characterise breeds at the molecular level;
   (b) construct a gene bank of all breeds to ensure cryo-preservation of samples of animal genetic resources;
   (c) devise a sound farm animal genetic resources management policy;
   and,
   (d) devise a strategy to optimally utilise animal genetic resources in a cost-effective manner in breeding programmes; and,

(iii) intensify regional and international cooperation in the field of animal genetic resources in terms of exchange of germplasm and joint collaborative research programmes.
11. APICULTURAL SECTOR

11.1 Honey Production

Honey is produced both in Mauritius and Rodrigues. Production of honey for Mauritius has decreased from 40 tonnes in 1996 to only 10 tonnes in 1999 due to the absence of food sources for bees following a period of severe drought. A reversal in this tendency was registered in 2000, with an output of 35 tonnes which rose to 50 tonnes in 2001. As for Rodrigues, due to the growing interest of the locals, production has generally taken an upward trend, from 19 tonnes in 1997 to 47 tonnes in 2000. In the year 2000, the country has satisfied about 40% of domestic demand. Between 1996 and 2000, imports of honey have known a characteristic see-saw pattern, with a peak of 107 tonnes in 1998 and a trough of around 56 tonnes in 1999. (See Table 6A).

11.2 Imported Breeds of Queen Bees

The genetic pool of bees have been constantly improved through imports of queen bees. Four colonies of the Italian race (*Apis mellifera lugistica*) were introduced in Rodrigues in July 1981, ten years after the extinction of the local species (*Apis mellifera unicolor*). Ever since, beekeeping flourished on the island and the interest of locals in this activity kept on increasing.

Five Italian Queens of the same race were imported again in 1991 by the Apiculture Division of the Ministry of Agriculture from the Rottnest island, Australia, with a view to strengthening and improving the genetic pool. These were placed on Ile aux Cocos in Rodrigues for one year under quarantine conditions and were subsequently transferred to the main island in 1992.
The Italian species, being a rare race of the temperate regions, has kept the instinct of storing honey for the winter and has proved to be highly productive, less aggressive and thus easy for handling for a commercial activity. Rodrigues is in fact among the rare countries in the world where only the Italian race exists. Honey production per hive is exceptionally very high in Rodrigues (80 kg in one honey flow Eucalyptus).

Good quality queens are in fact an essential parameter in successful honey production. Today, Rodrigues represents a bank of Queen Bees for Mauritius and other countries in the region like Reunion, Seychelles and Comores, not only because of its rich genetic pool but also due to the favourable quarantine conditions it is endowed with. Breeder queens are imported from Rodrigues into Mauritius every year for mass production from honeyflows of November to April. An average of 375 to 400 queens are being produced during normal years locally and sold to beekeepers.

11.3 Present Status in Rodrigues

According to a recent survey carried out by the Agricultural services in Rodrigues, the number of beekeepers has increased from around 115 from the early 1990’s to 145 in 2000, while the hive population has also more than doubled from around 800 to 1,660 for the same period. However, with the gradual destruction of melliferous plants and the sudden increase in hive population, the honey production can be potentially affected. In this respect, a rehabilitation plan to restore the population of melliferous plants is imperative. It appears that for ecological reasons, extending the acreage under Eucalyptus is not practically feasible. Thus, there is a pressing need to introduce other potential melliferous plants appropriate for honey production.
11.4 Other Benefits of Apiculture

Although the main aim of beekeeping is currently for the production of honey, the other potential benefits should not be neglected. Bees act as an important pollinating agent for fruit and vegetable production and thus contribute immensely to the horticultural sector especially with regard to citrus fruits, coconuts, creepers and vegetables. Moreover, several by-products such as propolis, royal jelly and pollen may also be exploited. As by-products are of high-value with respect to physical weight, and as there are large expanse of land still under forest areas, there may be potential to increase honey production if breeders are made conversant with the appropriate technology and if quality is emphasised.

11.5 Policy

With a view to optimising honey production and promoting beekeeping as a profitable commercial activity, Government proposes to:

(i) increase at the level of the Ministry the rearing of quality queen bees for sale to beekeepers;

(ii) provide the necessary technical and marketing support to interested individual and private sector concerns to undertake honey and queen bee production for the domestic and export markets;

(iii) encourage beekeepers to practice migratory beekeeping so that optimum benefit can be derived from a maximum period of honey flow;
(iv) set-up an Apicultural Resource Committee that would constantly review the sector and look into means of improving it;

(v) strengthen technical assistance to beekeepers through research and extension service especially with regard to management of colonies, avoiding risks of inbreeding, propagation of queens and processing and bottling techniques;

(vi) assign AMB the responsibility of importation of containers used in the packing of honey with a view to assisting in the value-addition process. This service could also be extended to other entrepreneurs in the trade;

(vii) provide duty free facilities on purchase of vehicles to apiculturists owning at least 25 hives with a view to assisting them in the transportation of hives to remote apiary sites; and,

(viii) provide duty exemption on foundation wax, an essential input in beekeeping which is currently being imported and, on equipment used in processing including extraction equipment;

With regards to apiculture in Rodrigues, the proposals are contained in extenso in Chapter 14 devoted exclusively to Rodrigues.
12. TEA SECTOR

12.1 Overview

Tea was the second largest revenue earner within the agricultural sector prior to the 1980’s. In those days, the local tea industry used to export 80% of its production. However, it is now no longer a commercially viable activity mainly due to uncompetitive prices on the world market. As a result, the size of the industry has been markedly reduced with the implementation of a diversification policy since 1996, which has favoured a gradual conversion of tea lands into sugarcane and other foodcrops cultivation.

12.2 Present Status

The tea industry now caters essentially for the domestic market and the quantity of tea exported is insignificant. This industry today involves four manufacturing companies, which altogether employ a workforce of around 200 people. These companies cater for the residual tea areas in the highlands. The area under tea cultivation stood at 660 hectares in 2001. Presently the tea industry involves around 1373 small planters. Production of manufactured tea stands at an average of around 1500 tonnes annually but is generally on a declining tendency. However, it has been noted that in 2001, owing to better climatic conditions, production of green tea leaves and that of black tea were both more favourable than in the previous year.

The major threat facing the local tea sector is the liberalisation of trade implying that foreign tea will be entering the local market at more competitive rates. An insignificant amount of tea is presently being imported mainly for blending purposes to produce value-added and top quality teas for high class hotels.
It is felt that, under normal circumstances, the tea sector would be able to satisfy local demand for years to come. However, in order to sustain this self-sufficiency target, it is felt that a replantation policy is essential at this point. The objective is to have a programme for the infilling of bushes which have suffered from diebacks over the past years, mainly caused by ageing of the plants and pest and disease infestations. In this respect, the Tea Nursery at Petit Merlo, managed by the Tea Board, will play a critical role in providing mother bushes for the production of new tea plants for the infilling exercise. This Nursery houses proven tea plants which have undergone a clonal selection programme since the 1980's.

**12.3 Policy**

With a view to maintaining local production to sustain local consumption, it is proposed to:

(i) initiate a demand-driven propagation programme of elite tea plants from the Tea Nursery, and subsequently supply high-yielding plants to small planters for the infilling programme, free of charge; and,

(ii) effect a survey on the pest and disease status in this sector, and accordingly reinforce research and precautionary measures to minimise losses caused at this level.
13. TOBACCO SECTOR

13.1 Overview

Tobacco is an important cash crop in Mauritius. Although tobacco cultivation occupies less than 1/2% of the total area of cultivated land, the industry generates about Rs 1.4 billion annually in the form of duties and taxes.

13.2 Local Production

Two types of tobacco are grown on a commercial scale locally, Virginia Flue Cured (VFC) tobacco which comprises the bulk of the domestic cultivation (more than 85%) and Amarello Air-Cured tobacco. VFC is grown in two seasons; a first season extending from January to August and a second season from July to January. About two thirds of the VFC crop are produced in the second season.

Recent tendencies have shown a regression in the performance of the tobacco sector especially with regard to local production. The sales of domestic cigarettes, which amounted to 1.25 billion sticks in 1995, stood at about 0.95 billion sticks in 2001, i.e. an average annual shrinkage of about 5%. The main reasons of the above can be attributed to high taxes and an active anti-smoking campaign gaining increasing momentum worldwide. Even if sales of imported cigarettes on the local market represented less than 0.1 billion sticks in 2001, it has nevertheless been noted that imports has adopted a generalised increasing tendency representing a share of 8% of total cigarettes in 2002 as compared to less than 1% in 1998.

A Task Force was set up in August 2001 with a view to identifying the threats and constraints challenging the Industry and to propose remedial solutions accordingly.
13.3 Constraints to the Sector

The following factors have been identified as major constraints hindering progress in the tobacco sector:

(i) Demand for domestic leaf tobacco, which is directly linked to local consumption, is decreasing with the intensification of the anti-smoking campaign and considering the fact that neither leaf nor cigarettes are exported.

(ii) With trade liberalisation, setting-up of regional trading blocks and implementation of WTO agreements, the domestic market is opening up to increasing competition from imported cigarettes. Imports of cigarettes have been increasing as illustrated by the sharp rise in the share of imported cigarettes on the domestic market from less than 1% in 1998 to about 8% in 2000, hence severely threatening the local production.

(iii) Decreasing availability of rotational land from sugar estates, especially during the second season when the bulk of the crop is normally produced, is considerably hampering production of flue-cured tobacco.

(iv) Sustained losses due to natural calamities with the second season of flue-cured tobacco coinciding with the cyclonic season.

(v) Production of air-cured tobacco is decreasing and the requirements of the manufacturer are not being met due to high land rent, unavailability of irrigation facilities and declining crop productivity due to poor varieties.

(vi) No cess is presently being imposed on imported leaf or cigarettes as is the case for domestic tobacco leaf. (See Subsection 11.5)

13.4 Research & Development

Two institutions are currently involved in research and development work on tobacco. While the Agricultural Research and Extension Unit (AREU) carries out research
on tobacco crop production and protection, the Agricultural Services focus on tobacco seed production which are provided to growers free of charge.

AREU research objectives are mainly:

(i) to enhance yield productivity and quality of locally grown tobacco; and
(ii) to minimise cost of production to render the industry more competitive.

In order to meet the above objectives, the research activities of AREU for this sector focus on:

(i) introduction and evaluation of improved germplasm;
(ii) seed and seedling technology;
(iii) productivity and quality improvement;
(iv) crop damage reduction; and,
(v) post harvest management.

The Tobacco Board also provides advisory and crop extension services to growers. There are established links with research for on-farm trials and diffusion of research results.

13.5 Levying of Cess

Presently, cess is levied on domestic leaf tobacco for the financing of a Special Research Fund and a Building and Equipment Fund managed by the Tobacco Board. Growers also contribute together with the Tobacco Board and the manufacturer to the Mechanisation and Inputs Fund.
No cess is presently being imposed on imported leaf or cigarettes as is the case for domestic tobacco leaf.

It is proposed to **reorient the levying of cess from the raw material (leaf), to the finished products, (cigarettes)**. The aim is to diminish the financial burden on tobacco planters. This strategy is in agreement with WTO rules provided that the same mechanism is applied to both imported and domestic products.

13.6 Policy

In light of the recommendations of the Task force and considering the above objective, it is sought to redynamise the sector by:

(i) setting-up a Tobacco General Fund, (TGF), to be managed by the Tobacco Board under the Tobacco Production and Marketing Act to facilitate collection of cess fees and enhance mobility of funds.

The TGF would have the following objectives:

(a) Financing the regulatory functions of the Tobacco Board;

(b) Financing the following schemes:

   - Research Scheme;
   - Building and Equipment Scheme;
   - Tobacco Planters Efficiency Scheme; and,

any other schemes as may be approved by the Minister of Agriculture on the recommendation of the Tobacco Board.
(ii) imposing a standard cess (quota to be determined) on both domestic and imported cigarettes to be sold on the local market and crediting the income into the TGF;

(iii) review the loan scheme provided by the Development Bank of Mauritius to encourage leaf production and consider the possibility of providing the same loan facilities as are applicable to the foodcrop sector;

(iv) requesting sugar estates to increase the acreage of rotational land made available for tobacco cultivation by 100 arpents with an extra 50 arpents in the Eastern and 50 arpents in the Northern region;

(v) motivating growers to group themselves and take advantage of regional cooperation to use the region as a potential production base;

(vi) reviewing the tax structure so that in monetary terms locally produced cigarettes are not more heavily taxed than imported ones to safeguard local production by increasing the Specific part of Excise Duty on imported cigarettes; and,

(vii) setting-up a Tobacco Research Advisory Committee under the aegis of the Tobacco Board to advise on research within the sector, with a view to reinforcing research carried out presently by AREU and better coordinating research needs, programmes and the diffusion of research findings.
14. RODRIGUES

14.1 Overview

In addition to fishing, agriculture is the other mainstay of the Rodriguan economy. While the Mauritian agricultural sector is faced with numerous challenges, Rodrigues, has also not been spared from this phenomenon.

14.2 Present Status of Agriculture

Despite numerous effort being directed to develop the economic sectors in Rodrigues, the fact remains that the agricultural sector faces serious difficulties. Initiatives to revitalise the sector are often hampered by numerous constraints, the main ones being imposed by climatic and environmental elements such as persistent droughts and soil erosion. Besides, the lack of a good local marketing system in Rodrigues is also a hindering factor to the survival of its agricultural sector.

Facts and figures clearly demonstrate that agricultural production has known drastic declines over the past decade (See Tables 6B & 6C). The total area under cultivation has dropped from 1294 hectares in 1990 to 367 hectares in 1998 (approximately 73% decrease).

Livestock farming which is an integral part of the Rodriguan culture, with families rearing their own animals (cattle, pig, poultry etc) in their backyards, is also in serious difficulty. Table 6 D illustrates Livestock export to Mauritius from Rodrigues for the last five years. There is an excess of cattle heads to the tune of 13,000 for 6000 hectares of pastures for grazing. The actual policy of Rodrigues with respect to cattle rearing is to reduce the livestock population to a sustainable level.
In fact, both agriculture and animal rearing activities have suffered considerably mainly due to recurrent and prolonged droughts. As a result, the total exports of agricultural products to Mauritius have accordingly drastically decreased.

14.3 Agricultural Exports to Mauritius

The declining tendency in production has drastically impacted on the exports within the agricultural sector in Rodrigues. Exports of certain major commodities to Mauritius have been markedly reduced over the last decade, some of which to the tune of exceeding 90%.(See Table 6E & 6F).

14.4 Observations

With the globalisation process, it is becoming increasingly difficult for items produced in Rodrigues to compete with standard mass-produced crops like maize and onions.

An analysis of the production sectors in Rodrigues provides a very bleak overall picture, characterised by an inefficient use of numerous schemes for financial assistance from the Development Bank of Mauritius. The Rodrigues Venture Capital Fund has failed in its objectives to trigger an economic diversification and to create employment. In fact the drastic fall in the area of land under cultivation is one of the major reasons for the rising unemployment rate in Rodrigues.

There is an urgent necessity to revisit agriculture in Rodrigues and work on a reorientation strategy, to give a new boost to the sector.
14.5 Potential of the Agricultural Sector in Rodrigues

A study effected by the Mauritius Research Council at the end of 1999, provided an overview of the status of the agricultural sector in Rodrigues, made a good assessment of the current weaknesses and identified existing potential. Among its recommendations, the report proposed as strategy to revive the agricultural sector of Rodrigues, the targeting of niche markets of high value-added, traditional Rodriguan products with an organic label.

Rodrigues as an “Organic Production Base”

Rodrigues holds the image of being a pollution-free, organic production base, which needs to be maintained, in light of the increasing tendency of the world market towards organic food and food products, with a growing health awareness. The demand for organic food presently exceeds the capacity of supply on the world market, production area rising at an annual rate of about 20% while demand is increasing by more than 30% annually.

Rodrigues has a rich heritage of traditional foods which can be efficiently marketed with an organic label. The appropriate strategy should firstly provide for the rehabilitation of the traditional sectors, and secondly, value-addition to agro-products for export. The immediate major products which can be targeted readily include the typical Rodriguan lemon, chilli, Toupie onions, honey and red beans.

The rehabilitation component will involve identifying the key obstacles on the production front with a view to ensuring a constant and reliable supply in terms of quality and quantity to meet the potential demand, once the market is developed.
The value-addition component will involve the institution of micro and mini agro-industries of selected Rodriguan specialities, supported by the appropriate certification policy to ensure conformity to set international norms and standards for export. The right framework to obtain organic certification will need to be established.

14.6 Priority Projects

1. Value-Addition of lemons

Over the years, Rodriguans have developed exclusive recipes of ‘piment-limon’ and ‘aigre-doux limon’, which are nowhere else to be found and are highly appreciated by many. Such recipes hold promising potential for export, provided they are produced in accordance with international norms and standards, taking into account the increasing customer exigencies and emphasis on food safety. Pickled lemons are also in high demand and hold good marketable potential in Europe. Vacuum packaging of pickled lemon for export could provide promising opportunities.

2. Rodrigues Chilli

There is an urgent need to rehabilitate the typical Rodriguan chilli cultivation which has been degenerating since the introduction of new imported varieties and the resulting subsequent cross breeding. There is also a need to constitute a strategic stock of germplasm of the chilli variety to allow its propagation.

Chilli can also be marketed in the processed form as pickled chilli and ‘piment-limon’.
3. **Toupie Onion**

With years of selection, this variety has developed exclusive characteristics, which include a special taste and a relatively long conservation time. However, there has been a degeneration of the strain, which makes it imperative to establish a gene bank and produce seeds for medium scale plantations. Findings of studies on drip irrigation for onion plantations carried out in Mauritius could also be applied to Rodrigues.

The small onion can be prepared as a high-value added pickle for export. The results of an ongoing MRC funded project on vacuum packing of pickled fruits and vegetables could be used for this project.

4. **Production of dried Rodriguan local Red Beans for export.**

Rodrigues possesses a special variety of red beans with typical local characteristics over years of selection. However, the actual production is relatively poor in terms of volume. A study needs to be carried out on methods of increasing the yield while preserving the characteristics of the variety. Appropriate post-harvest drying and packing techniques would have to be developed to ensure optimum quality and premium prices for the export market. Solar or conventional drying techniques could be investigated.

5. **Honey and Italian Queen Bees production**

The bee-keeping sector was initially quite successful in Rodrigues. However, over the years there was a genetic degeneration of the colonies. The accidental introduction of the chamaleon has caused some harm to the colonies.
Following the extinction of the local species of bees in Rodrigues, Italian species were introduced which have the characteristics of being more productive and less aggressive. Rodrigues is today well known for its high quality honey production, which is nevertheless declining owing to gradual destruction of the natural habitats of the honey bees.

The establishment of a rehabilitation plan is thus essential. This plan should include promotion of bee keeping as a profitable activity and provide for necessary training to local entrepreneurs for the production of queen bees. A strategy for preventing the genetic degeneration of the Italian species of bees should be worked out. The rehabilitation plan should also include techniques to control or eradicate the chamaleon from Rodrigues.

The idea is to take advantage of the isolation of Rodrigues to produce pure-bred Italian queen bees for export. This is a high value-added activity that can be expanded through some specialised training. The hives would at the same time produce some of the best honeys in the world from “Campeche” and “Eucalyptus” nectar. Such quality is not achievable in Mauritius due to contamination by sugar from sugarcane stumps. Bees also play a key role in the pollination of many fruit trees and therefore bee-keeping can simultaneously optimise fruit production.

Finally, the potential of marketing processed honey in appropriate packaging needs to be harnessed. This should be carried out to the highest standards and marketing channels for the export of the honey and queen bees should be established.
14.7 Other Proposals relevant to the Agricultural Sector

(i) Water Scarcity

Projects need to be worked out to devise means for optimal and sustainable exploitation of underground water reserves through controlled pumping of alluvial water deposits, to potentially catch fresh water that would otherwise go to the sea. A prototype of this system is already operational in the south of the island.

(ii) Need for training of local staff

It is important to provide necessary training to the stakeholders in the agricultural sector and ensure a continuous and sustained support at the initial stage especially to ensure proper progress of projects to be launched.

14.8 Policy

In view of the highlighted potential and constraints of the agricultural sector in Rodrigues, it is proposed:

(a) for the foodcrop sector, to:

(i) carry out a survey of the agricultural activities in Rodrigues in collaboration with the Central Statistical Office;

(ii) rehabilitate the Rodriguan lemon and chilli cultivation on pilot scales through propagation of selected elite varieties by grafting and
improvising drip irrigation systems and hydroponic production technique in dry areas;

(iii) review and update the report on ‘Seed and Seedling Production in Rodrigues’ produced in 1997 by the Agricultural Services, and ensure its implementation to meet the present demand of planters;

(iv) discourage the use of chemicals and fertilisers to retain its organic status of the island;

(v) offer training to Rodriguans in modern farm management and cultivation practices, organic agriculture and transfer of technology;

(vi) ensure proper dissemination of information on facilities offered in the agricultural sector and on procedures to be followed, to interested new entrants;

(vii) reinforce research into various aspects of production, including early disease diagnosis and identification of potential commercial crops that can be cost-effectively grown in Rodrigues;

(viii) introduce new varieties of cash crops with a view to developing export;

(ix) set up a cold room facility for storage of onions;

(x) look into the possibility of extending the marketing services of the AMB to cater for primary products produced in Rodrigues other than onion and garlic, with a view to exercising a better price control and ensuring a decent profit margin to Rodriguan planters;
(xi) study the possibility of providing mechanical services for Rodriguan planters to assist them in land preparation;

(xii) look into the possibility of setting-up a Unit in Rodrigues to look into water-related issues, with a view to ensuring a proper management of existing irrigation infrastructure and devising a mechanism for efficient water management in general;

(xiii) strengthen extension service to Rodriguan growers and farmers; and,

(xiv) look into the possibility of extending the services of the Small Planters Welfare Funds to Rodriguan planters.

(b) for the agro-processing sector, to:

(i) increase the value-added of bio-products through local processing according to international norms and standards by:

(a) identifying existing entrepreneurs to constitute the nuclei around small and medium scale agro-processing operations;
(b) providing necessary training on transformation techniques; and,
(c) extending the services of the local Certification Agency to be established in Mauritius to Rodrigues to certify for ‘organic products’.
(c) for the apiculture sector, to:

(i) carry out a survey of the whole sector, in particular of the present total number of hives and the size of plantation of melliferous plants over the island, and accordingly work out a sustainable number of hives that can be cost-effectively kept in honey production;

(ii) extend the analytical facilities of the Ministry in Mauritius to apiculturists in Rodrigues for the testing and monitoring of honey quality, and for analysis of hive debris for disease diagnosis;

(iii) provide training to technicians in Rodrigues on various aspects of apiculture including quality analysis, management and rearing of queen bees etc;

(iv) reopen the ‘Maison-de Miel’ situated at Citronelle to be used for processing and stocking of honey by the ‘Association des Apiculteurs de Rodrigues’;

(v) ensure that the existing melliferous plants, in particular eucalyptus cultivation, are not destroyed;

(vi) set up a ‘Technical Committee’ to identify potential melliferous plants that could offer good source of nectar and at the same time be ecologically-friendly, and accordingly work-out an appropriate rehabilitation programme for Rodrigues;

(vii) provide duty free facilities on the purchase of vehicles to apiculturists owning at least 25 hives, to be used for the transport of hives and honey; and,

(viii) provide duty exemption of imported foundation wax used in apiculture.
(d) for the livestock sector to:

(i) ensure to farmers at all times, a regular, timely and adequate supply of the different types of animal feed which are imported from Mauritius and distributed through the Government agricultural services;

(ii) ensure a regular and timely availability of medicines at the Veterinary Services for farmers in Rodrigues;

(iii) ensure a reliable distribution of water to farms particularly during periods of drought;

(iv) reinforce research in the sector;

(v) provide training to farmers on modern farm management and on adoption of new technology in their activity;

(vi) review the mechanism of supply of young animals at the stations to farmers, and consider the reopening of the Livestock Station at Maréchal, in view of the high demand for young animals for breeding;

(vii) investigate into the possibility of setting up appropriate regional infrastructure for the temporary housing of live animals with a view to minimizing losses in the event of natural calamity;

(viii) provide soft loan facilities to breeders for the construction of shed houses;

(ix) study the feasibility of setting-up a modern abattoir in Rodrigues to ensure that slaughtering is done in conformity to international norms, with a view to developing potential export avenues in the sector.

Furthermore, it is proposed to extend the services of the proposed Marketing Intelligence Unit as at p157 of Chapter 17, to agricultural stakeholders in Rodrigues to ensure a proper marketability of their produce.
15. AGRO-INDUSTRIAL SECTOR

15.1 Overview

Agro-industry forms an important part of the socio-economic framework of Mauritius. This sector encompasses a wide range of activities with enterprises having different levels of organisation ranging from relatively large ones to small cottage and backyard activities. It is estimated that this sector employs around 10,000 people, and satisfies a relatively small share of the total domestic demand, contributing to only around 2% to GDP.

15.2 Current Status

Over the years, a number of agro-industrial enterprises have managed to successfully establish themselves and have steadily developed their activities of transforming raw materials into value-added products. A few large processing plants have emerged principally in the areas of edible oil refining, animal feed compounding, wheat flour milling, and tuna canning. Some enterprises import fruits and vegetables which are processed for the domestic market. A few smaller scale enterprises have managed to develop in areas of foodcrop processing and preservation through a wide variety of exotic recipes, using locally available raw material.

15.3 Markets

The primary objective of local agro-processing industries was to supply the domestic market. However, over time, owing to the limited size of the domestic market, some enterprises started to tap regional niche market opportunities (e.g. wheat flour).
A few smaller scale agro-processing companies have also managed to tap export markets through their variety of exotic products at the regional and international level. However, so far only the export of canned tuna mainly towards UK has registered a sustainable growth.

15.4 Raw Material for the Agro-Processing Sector

Most raw material used for the local agro-processing industry is today imported with only around 5% emanating from the local horticultural production. Also, most processed food consumed locally is imported accounting for a Food Import Bill of around 13% of the total import bill in the year 2000. This strong reliance on imported raw material as primary inputs can be accounted for by a number of inherent constraints to the sector. These can be summarised as follows:

(i) land scarcity which hinders large scale production;
(ii) high cost associated with local production of agricultural produce coupled with a rising cost of labour; and
(iii) adverse agronomic and climatic factors.

These contribute to a limited and erratic supply of raw materials from local sources which is also generally associated with high prices. It has also been noted that the varieties and quality of the local produce do not always suit the requirement of the agro-processing industry. As a result, the local companies are compelled to turn to imports which not only provide a cheaper alternative, but also to a certain extent, ensure reliability and regularity of supply, over and above quality and variety assurance.
15.5 General Trend

The local agro-industrial sector has so far been able to survive owing to the policy framework of the Government aiming at an import substitution strategy which has led to the imposition of trade barriers to protect the local market. Exports have been possible within the sector owing to the preferential access of Mauritian products to the European market, Mauritius being part of the ACP countries. Preferential Trade Agreements under the previous Lomé Convention has imparted to Mauritius a competitive edge in its export endeavours over its non-ACP competitors.

However, with liberalisation of trade, local agro-processing enterprises are already subject to harsh competition by imported products on the domestic market which may severely threaten their performance and sustainability. The globalisation process will inevitably entail gradual erosion of trade barriers which will further expose local enterprises to severe foreign competition in the sector. Therefore, local agro-processing industries are likely to lose their domestic competitive edge with cheaper value-added products entering the local market coupled with the rising cost of imported raw material. The gradual erosion of export subsidies on the other hand will have direct adverse impact on the development of export within the sector. It is therefore crucial that the current situation within the agro-processing industry be reassessed and the right strategy devised to give a new orientation to the sector.

15.6 Attributes of Mauritius for the Development of Agro-Industry

Despite the numerous constraints elaborated above, Mauritius is endowed with certain attributes that may be efficiently harnessed to boost its agro-industrial sector. The country, for instance, already harbours a pool of core competence, know-
how and technology in the field that offers it a comparative advantage over its regional counterparts. Some established agro-processing companies are already operating under international licenses and franchises. This imparts an advantage to Mauritius in the global network. Furthermore, modern infrastructural facilities such as sophisticated port and airport logistics and good internal and external communication networks are added merits to plan further development and expansion of the sector. The Freeport with its objective to offer state of the art logistics such as modern warehouses, cold rooms and processing centres, will give an additional competitive edge to the development of the local agro-industry. Mauritius also has skilled local core competence in relevant scientific research areas of food technology to provide the necessary technical back up to such development.

15.7 Future Objectives

All these taken into consideration, it is felt within Government and the private sector that the future development of agro-industry in Mauritius lies in embracing a regionalisation approach. This would open up the possibility of Mauritius to use advantageously the resources and facilities available in neighbouring countries to produce primary products on large scales at competitive prices for its local agro-industry. Such a process would assist Mauritius to emerge as an agro-processing hub in the long term. The model of Singapore, another net importer of food like Mauritius, can be adopted in this regard. This country has managed to successfully emerge as an international agro-processing hub, using the production capacity of its neighbouring countries through proper utilisation of its know-how, innovative technologies and efficient communication and port and airport logistics.

There also exist possibilities whereby the country could benefit through the development of franchising between local entrepreneurs and experienced
international operators in specific areas of agro-processing. Such possibilities would not only provide a relatively higher degree of security in terms of establishment of business, but would also allow the necessary transfer of technology and training of Mauritians in relevant fields of technology application and business management such as marketing, selling and other operational aspects.

15.8 Food Quality and Safety

Quality of food is becoming an issue of increasing importance in today's world with an increasing health awareness among the population and the unprecedented rise in the occurrence of diseases linked to poor eating habits. Mauritius, in fact, has a very high rate of Non-Communicable Diseases such as diabetes, hypertension and cardiovascular diseases (CVD) which are all, to some extent, associated to food habits.

Quality is not characterised by the physical appearance of food but, most importantly, to its intrinsic properties, mainly with regard to presence of toxins, chemicals residue content, and the percentage composition of certain substances such as fat content. Quality is therefore an important factor to be taken into consideration whilst planning a strategy for the development and expansion of the agro-industry. It is vital that such development be carried out in conformity with international norms and standards with regards to food safety and quality in order to ensure sustainable investment within the sector.

With the trend towards globalisation and increasing health awareness, agricultural commodities are increasingly being required to comply with certain norms in order to qualify for trade. These issues call for effective traceability in the agro-food chain from producer to the final retailer. This also implies better accountability from the part of agricultural entrepreneurs to the buyer of their products.
Pesticide residue content will increasingly dominate the trade of agricultural produce with the enforcement of regulation on pesticide residues by the European market. With the fixation of Maximum Residue Levels (MRLs) for every crop, ACP export of tropical fruits to Europe would be dramatically affected owing to the present tendency of abusive use of chemicals in common agricultural practices. Mauritian exports within the agro-industrial sector using local raw materials would not be spared either, if the proper remedial action with regard to controlling chemical inputs at the production level is not adopted.

Therefore, in this context, it is essential for the country to be endowed with the necessary analytical capacity, legislative framework and enforcement agencies in order to ensure that food production and processing meets the appropriate norms, to safeguard public health, to ensure competitiveness of products, and to facilitate exports. In this respect, it has been noted that existing laboratory facilities under the aegis of the Ministry of Agriculture are not adequate.

15.9 Policy

With regard to the above, it is proposed to:

(i) identify primary products usually imported for agro-processing, that can be cost-effectively produced locally and regionally;

(ii) devise appropriate strategies to ensure production and supply of raw materials for processing at affordable prices at the local level with a view to reducing the dependence on imported raw materials;
(iii) investigate into the possibility and feasibility of using the region as production base for raw materials;

(iv) sensitise potential entrepreneurs on existing schemes for agro-industrial development;

(v) provide specific training to potential entrepreneurs in the agro-processing sector;

(vi) provide the appropriate level of support to the local agro-industries in terms of export marketing intelligence through the proposed Marketing Intelligence Unit;

(vii) promote foreign investment in the agro-industrial sector in Mauritius through joint ventures;

(viii) set up a state-of-the-art multipurpose Food Technology Laboratory to allow timely and affordable technical and analytical support to the local agro-industry, to encourage the local development of processed foods, to ensure that food production is done in conformity with the required norms and to facilitate exports;

(ix) provide additional incentives in the form of soft term loans for the acquisition of agro-industrial equipment;

(x) encourage grouping of producers to achieve quality production with a view to promoting agro-industrial development;
(xi) provide incentives under an ‘Innovation Scheme’ to promote the development of new commercial transformed products;

(xii) set up a permanent joint Government/private sector committee to discuss all matters related to agri-business;

(xiii) set up an ‘Agro-Industrial’ cluster that would regroup all agro-industrial entrepreneurs with a view to promoting the concept of sharing of resources towards better efficiency within the sector (more details in Chapter 20);

(xiv) sign bilateral agreements regarding the protection of Mauritian investment in the region;

(xv) ensure that the new opportunities arising from regional cooperation through SADC, COMESA and IOC Trade protocols are efficiently tapped;

(xvi) consider new trade opportunities with the USA in the agro-processing sector through the AGOA;

(xvii) reinforce research in food-processing technology mainly geared towards finding efficient means of preservation of specific seasonal food commodities;

(xviii) encourage local entrepreneurs to further explore opportunities of franchising through the proposed Marketing Intelligence Unit; and,

(xix) explore the possibility for local entrepreneurs to have recourse to international loan facilities for the expansion of agro-processing activities.
16. REGIONALISATION

16.1 Overview

It is unanimously accepted that if Mauritius wants to emerge as a full-fledged business hub, the country needs to devise a forward-looking strategy within agriculture, tap all opportunities in the region and elsewhere, and build itself as a powerful regional and international agro-processing centre. Such a strategy has to be in tune with ambitious endeavours in other sectors including finance, trade and information technology aiming at transforming the country into a business and knowledge centre of excellence.

Moreover, with the trade liberalisation process in full swing and the elimination of tariff barriers in the context of trade protocols binding the COMESA, SADC and IOC regional groupings of which Mauritius is a member, the local agribusiness sector, specifically the agro-industrial sub-sector, is becoming increasingly exposed to severe competition from bigger and more powerful overseas producers. There is therefore an urgency to gear the sector towards achieving long-term competitiveness and to take full advantage of the emerging opportunities which globalisation also entails, besides opening the door to harsher competition. The new strategic orientation has necessarily to take into account the renewed opportunities provided by the Cotonou Agreement and the export possibilities for agricultural produce offered by the United States of America through the Africa Growth and Opportunity Act (AGOA). The AGOA, which aims at fostering trade links between the USA and Africa, will definitely accelerate the process of regional cooperation and broaden the industrial base in the region.

However, owing to the numerous inherent constraints faced by Mauritius as regards agricultural production, it is clear that the country is not in a position to meet the above-mentioned challenges and seize new opportunities by itself. Mauritius alone does not have
the required production capacity. Taking this into account, it is widely felt within the agricultural non-sugar sector that **Mauritius should move away from an inward looking strategy and adopt instead a more outward looking approach focused on broader regional and international markets.**

### 16.2 Regional Opportunities

It is unanimously recognised that within the new strategy, **Mauritius has to take advantage of the region as a production base and to utilise the production capabilities in neighbouring countries** to develop locally a strong export-oriented agro-processing industry. In so doing, domestic industries in the agro-industrial sector will be in a position to better face competition and at the same time exploit new export avenues.

Opportunities in agriculture do exist in certain neighbouring countries including Madagascar and Mozambique. These countries have abundant **unexploited land resources and offer very cheap labour**. Their climatic cycles are quite interesting and many crops can be cultivated year-round. Also crops, such as potatoes, that cannot be grown in Mauritius in specific periods can be cultivated during these same periods in these countries, thus ensuring a regular supply. **The possibility of producing within the region a number of other primary products, such as maize, onion and garlic with guaranteed access to the local market needs to be seriously considered.**

### 16.3 Future Objectives

Two major constraints in exploring regional opportunities are, however, political instability and poor sanitary and phytosanitary conditions. There is, therefore, a need to realistically assess the investment potential as regards agriculture in the region as a whole, set up a public-private sector task-force to look into existing opportunities in
all its aspects and make recommendations accordingly, elaborate a framework within which investments will take place and encourage such investments including joint ventures with appropriate incentives.

More importantly, there is a necessity for Mauritius to discuss and sign bilateral trade agreements such as Investment Promotion and Protection Agreements with countries where Mauritian operators will be investing.

As far as sanitary and phytosanitary norms are concerned, it is felt that establishing and vigorously enforcing international norms in Mauritius and in countries where Mauritian operators will be investing, are essential prerequisites for achieving success in regional and international trade endeavours.

16.4 Policy

In view of the above, it is proposed to:

(i) set up a public/private sector task force to dynamise regionalisation endeavours and advise Government on necessary actions;

(ii) identify means of financing evaluation studies on the feasibility of using the region as production base;

(iii) sensitise and help countries of the region where Mauritian entrepreneurs will be investing in establishing and enforcing international sanitary and phytosanitary norms. (Concerted actions within the SADC, COMESA, IOC, IOR frameworks are likely to pay dividends in this respect);
(iv) review the Regional Development Scheme to provide for additional incentives in the agricultural sector and look into the possibility of decreasing the minimum amount of investment required for its eligibility;

(v) review the Industrial Expansion Act of 1993, which provides for a series of incentives for agro-industrial development, to cater for regional initiatives;

(vi) consider establishing air links where need be to support the regionalisation process;

(vii) allocate resources to the Marketing Intelligence Unit to provide information and act as an interface between Governmental institutions and investors as regards investment policies, regional and international import statistics, legislative and fiscal issues, amongst others;

(viii) set up a desk in all Mauritian Embassies in order to improve the collecting and synthesising of information on investment opportunities as well as to disseminate information to potential joint-venture partners; and,

(ix) investigate into the possibility of setting up an Export Credit Guarantee Scheme to safeguard exporters against trade related risks such as insolvency of foreign buyers and delayed payments.
17. MARKETING

17.1 Overview

The overall vision of Government in the non-sugarcane agricultural sector is to make of it a profitable industry with an eventual export orientation. This implies that emphasis has to be laid, in the first instance, on a sustained increase in production of quality and diversified primary and secondary products; and secondly, on an increase in value-added products. Production, however, needs to be complemented with a dynamic marketing system which will play the role of a catalyst between the producer and the consumer and ensure efficient and profitable product absorption.

It has been noted that marketing in the agricultural sector has so far been a rather randomly conducted activity, undertaken by producers and prospective local exporters with no documentation and information system on market potential and tendencies for an effective market and product analysis. As a result, it has not been possible to derive maximum benefits from our agricultural exports, either because the wrong markets were often targeted, or because the products do not often meet the customers needs and demand for better presentation. Also, products exported do not always suit the requirements of the markets, where the tendency is more towards ready-to-consume, and time saving commodities.

17.2 Importance of a Structured Marketing System

In line with the context of the plan, whereby quality and diversity of production in the non-sugar sector is being actively encouraged, the need to establish a dynamic and fully functional marketing system becomes imperative to ensure optimal marketability of our produce both locally and internationally. This system should be designed in such a way as to guarantee the sustainability of the Mauritian agricultural sector by efficiently
reconciling the needs and expectations of all the stakeholders, be they farmers, marketing agents, food processors, exporters or consumers.

A functional and effective marketing mechanism should allow agricultural producers to plan investment according to consumers’ needs in terms of quantity, quality and timing with respect to product demand. Efficient allocation of resources would avoid physical losses of produce as well as financial setbacks, and at the same time, would ensure that all agricultural activities become economically profitable.

As emphasised earlier, the targeted line of action in production is to encourage a progressive adoption of modern technologies shifting from the usual conventional approach to a more sophisticated culture. Since investments are involved, it is imperative for the marketing system to find outlets for the high-tech produce.

17.3 Importance of Adequate and Timely Information

The marketing system should also be well versed with market tendencies with respect to specific products and should be able to provide accessibility to producers to reliable information on market demand at all times. Additionally, statistics on areas under cultivation at particular stages for specific commodities would be useful in fine-tuning production decisions. These information would ensure that investment is not effected randomly, merely according to season or impressions of market demand, but instead will be based on reliable statistical information.

Production under the present system is done in a quasi disorganised manner, which explains an overproduction of certain items at times and an acute scarcity of same at other periods of the year. Thus, the marketing system should pave the bridge between the producer and the market to ensure supply as per demand. Such a market mechanism would thus, prevent losses that are incurred by the producers through inefficient planning and investment.

A Marketing Intelligence Unit
In view of the need for timely information, the setting up of a Marketing Intelligence Unit becomes imperative. This Unit which will operate under the aegis of the Ministry of Agriculture, Food Technology & Natural Resources, will have as main objectives:

(a) establishment of links between producers and buyers to align production according to demand;
(b) compilation of data and statistics on product demand and market potentials and their subsequent dissemination to the various stakeholders;
(c) continuous surveying on market demand and trends, locally and internationally;
(d) identification of new market opportunities locally and internationally for our local produce;
(e) provision of continuous feedback to local agricultural stakeholders on market exigencies and changes, norms and standards to enable continuous upgrading of our agricultural produce; and,
(f) acting as a facilitator for export through close collaboration with the MIDA.

Along the same line, for timely availability of information within the foodcrop sector, a study was commissioned by the Agricultural Research and Extension Unit (AREU) in April 2002 on the ‘Setting up of Market-Information System and a Communication System' which benefited from financial assistance from the International Fund for Agricultural Development (IFAD). The study which was conducted in the context of the Rural Diversification Programme (RDP) by the Landell Mills Ltd, had the objective of working out an action plan for the establishment of a market information service and a communication system intended to cover foodcrops including vegetables and fruits produced and marketed in Mauritius. This service is targeted primarily to selected groups of the irrigated agriculture component of the RDP but also to all non-sugar planters in general.
Some of the major objectives of the study were to:

(i) develop an information system for monitoring and reporting of production and marketing of foodcrops;
(ii) propose methods for rapid collection and dissemination of information to planters;
(iii) propose ways for promoting locally produced foodcrops;
(iv) identify support systems for the promotion of export of foodcrops;
(v) design a system for market forecasting for early predictions of demand, supply, gluts, shortages etc.;
(vi) recommend means of transfer of updated production technologies to planters;
(vii) propose means for creating awareness among growers and consumers of quality standards and pesticide residues; and,
(viii) develop a methodology to introduce farm management concepts in various aspects of agricultural production.

The findings of this study which were submitted in May 2002, would be instrumental in setting up the mechanism for the proposed Marketing Intelligence Unit and in providing the framework for organising production in the sector and aligning it with respect to demand. Along the same line, the market information specialist whose services would be sought in the context of the Northern Plains Irrigation Project (NPIP), as stated at page 35 of Chapter 3, will play an important role in implementing the findings of this study.

The duties of the market information specialist will inter-alia, involve:

(i) the implementation of a market information system for monitoring and reporting of market data of vegetables and fruits in the Northern Plains Project areas, including area under cultivation of each crop, cropping calendar of planters, volume harvested for each crop, volume of produce in major marketing outlets,
production and post-harvest information to ascertain quality and quantity of produce, amongst others;

(ii) the setting up and implementation of data collection and dissemination methods for elements mentioned in (i) above including any training required for field staff and planters in its proper execution;

(iii) the review and strengthening of mechanisms for dissemination of market information through the media;

(iv) the identification of support services required for the promotion of exports of agricultural products;

(v) the establishment of market opportunities with relevant local, regional and international institutions to facilitate export of agricultural products; and,

(vi) the setting up of the appropriate framework to ensure that market intelligence is integrated into management decisions at farmer level.

17.4 The Local Auction System

In a diagnostic report on Mauritian vegetable marketing, carried out by the Analysis Research Consultants following a FAO/IFAD formulation mission in Mauritius in January 1998, the International Fund for Agricultural Development and Japan’s Official Development Assistance identified the main constraints at the level of auction as follows:

(i) absence of information,

(ii) lack of transparency, and,

(iii) poor physical infrastructure.

The proposal for reform was not to aim at eliminating auctioneers but instead, at redefining their role and properly monitoring the mechanism.
Although the report expressed concern over the present conditions of auction, local farmers have no better alternative than to use auction for produce sale and disposal to other channels for a number of reasons. For instance, the present system allows bulk disposal especially with respect to perishables, saves farmers' time, and provides an outlet for a range of grades of products without consideration of quality, hence providing a certain degree of financial security to producers. The use of auction figures as a basic price indicator with respect to the supply of produce to processing plants or other market intermediaries, is still a common practice in the planting community. The above situation highlights the importance of an auction system in light of the heavy dependence of the planting community on it.

Although the present system allows easy and rapid sale of products, it, in no way, guarantees the best probable price to the producers. Most of the time, this operates at the detriment of producers who often find themselves incurring financial losses, due to the fact that not much control can be exercised over the auctioneering practice and prices are at the mercy of the auctioneers and other intermediaries. Also, the present auction system encourages dumping with complete disregard to norms and standards as far as issues of food hygiene and safety are concerned. This reiterates the importance to review and restructure the present system to give it a more functional dimension in light of the present weaknesses.

Indeed, a fully operational auction system could play the ideal role as a price setter and quality regulator, provided it is based on an appropriately defined grading system complemented with a close monitoring by appropriate authorities to ensure conformity to applicable norms and standards with regard to issues of food safety, sanitary parameters and hygiene, quality, pesticide residue content, etc. Such a system could act as an efficient tool to provide information to both producers and consumers at the local level, hence enabling the establishment of appropriate reforms in the marketing strategies in accordance with supply and demand.
17.5 Importance of an Export-Oriented Strategy

Viability of investment in high technology will depend on the capacity to consolidate our present markets and most importantly, to tap new potential opportunities arising from endeavors to achieve a competitive edge. The local market being very small, the right strategy would be to develop more attractive export avenues in our existing niche markets, and, to seriously consider potential that exists in the region - mainly the Indian Ocean Rim countries, and the wider international market, such as Japan, the European Union, and the United States. The latter three economies have large domestic markets but exports can be hampered by cost of air freight, distance and proximity of competitors to them. Strategies to tap these markets should be geared towards products with higher value-added and longer shelf-life. As regard the USA markets, opportunities under the AGOA need to be fully tapped.

Continuous and consistent knowledge of market outlets for specific commodities will be the key instrument for the country's export strategy. Information that would be essential to the agricultural stakeholders include:

(i) market tendencies with a good reflection of the change in demand, customer taste and preferences, prices and buying intervals;

(ii) appropriate conditioning and ideal packaging of products with reference to value-added items; and,

(iii) chain of distribution and channeling of the products at the export end.

17.6 Policy

In view of the above, the necessary measures will be taken to:
(i) restructure and improve the existing infrastructure at auctions in accordance with international norms and regulations;

(ii) study the possibility of introducing a grading system for fruits and vegetables;

(iii) devise a price setting mechanism within the auction system to ensure that producers derive a decent margin of the profits. The mechanism should also ensure that the profit margins derived by the auctioneers and intermediaries do not result in exorbitant selling prices to customers;

(iv) ensure that the appropriate authorities (Ministry of Health and Ministry of Agriculture – Phytosanitary Division, Chemistry Division, etc.) closely monitor the operation of the auction to ascertain conformity to norms on sanitary parameters, quality, grading and food safety;

(v) redefine the role of the Agricultural Marketing Board to ensure inter-alia the proper function and monitoring of the auction system;

(vi) set up a Marketing Intelligence Unit which will have as responsibility to:

   a) continuously monitor market;

   b) adjust market strategies;

   c) compile statistics to provide latest data on product demand to producers and exporters; and,

   d) provide continuous feedback to local agricultural stakeholders as regard to market exigencies, norms and standards to enable continuous upgrading of our agricultural products.
implement the findings of the study commissioned by AREU on the ‘Setting up of a Market Information System and a Communication System’ for the foodcrop sector in assisting the proposed Marketing Intelligence Unit in its functions;

work out, in collaboration with the Mauritius Standards Bureau, a mechanism for the proper labeling of foodcrops:
- sold on the local market, to enable easy identification of premium varieties; and,
- meant for export, to impart a standard Mauritian branding.

device a mechanism to ensure rapid and efficient traceability, particularly for exported commodities;

look into the possibility of allocating a certain number of reserved stalls for cooperatives at market places;

provide appropriate training for primary value-addition, such as efficient packaging techniques, with a view to enhancing quality standard of products sold locally; and,

review the freight rebate scheme to cater for new foodcrop commodities with a view to allowing potential export avenues to take off.

18. NEW TECHNOLOGY

A critical look at the current situation prevailing in the Mauritian agricultural sector, taking into account the country’s strengths and weaknesses in this field, further reiterates
the need for a gradual transition from traditional practices towards modern sophisticated technologies.

In view of the characteristic changes in demand for quality and quantity coupled with accentuating competitiveness at the international level, the development and success of our agricultural sector relies largely on the adoption of modern technologies.

18.1 Biotechnology

18.1.1 Overview

Biotechnology has been defined as a series of enabling technologies that employ living organisms (or part of organisms) to make or modify products, improve plants or animals, or develop microorganisms for specific uses. Modern Biotechnology today involves the application of the Gene Technology to generate a wide range of commercially profitable commodities with novel traits and characteristics and offers significant potential for raising agricultural productivity (including livestock, fisheries and forestry).

Biotechnology in agriculture is now recognized by the international scientific community to be an essential, and increasingly important element of a critical strategy, integrating both conventional and biotechnological applications, in order to achieve future food security.

Biotechnology is gaining a lot of momentum in the agricultural scene globally with regard to the enormous potential and possibilities it harbours. At the national level, Biotechnology represents a promising futuristic tool to the Mauritian agriculture in responding to the numerous existing challenges within the sector and in addressing several of its most pressing weaknesses, at a pace that is unachievable, if at all possible, through conventional means. Mauritius also has
the advantage of being one of the few nations in the region to be endowed with a highly skilled scientific manpower resource in innovative scientific fields including biotechnology. This technical asset would be instrumental in facilitating the uptake of this new technology and in reaping its optimal benefits, and, also in achieving a cutting edge in this field at the regional front in the longer run.

Considering Government’s conviction to give a new technological boost to the agricultural sector in line with the high level of sophistication taking place in the other key economic sectors of the country, the Ministry of Agriculture is proposing to address the challenges within the sector through the implementation of biotechnology-based approach.

18.1.2 Current Applications of Biotechnology

The sugar sector, supported by the strong research back-up of the MSIRI, has known some successful achievements in the field of biotechnology. This institution through the solid equipment and scientific resources it is endowed with, has been delivering a number of services in biotechnology in the sugar sector. Some examples include, the application of molecular methods for rapid disease screening, the use of molecular markers in enhancing breeding of novel varieties, the use of tissue-culture for rapid multiplication of planting material and more recently the use of genetic engineering in the development of transgenic herbicide resistant varieties.

Achievement in the non-sugar agricultural sector has, on the other hand, remained negligible despite numerous attempts made in this direction over the last five years. The main endeavours attempted to date include tissue-culture propagation of planting materials of certain horticultural commodities, mainly ornamentals, the use of molecular methods for rapid disease diagnosis in the crop sector, and the production of vaccines for the poultry sector. It is however noted that the benefits accruing to the end
users have generally remained below the expectations with most of these attempts often remaining at the experimental stage.

18.1.3 Limitations to the Application of Biotechnology in the Non-Sugar Sector

The reason attributed to the unsuccessful achievement of biotechnology within the non-sugar sector is multi-factorial. However, a major pitfall has been the lack of an appropriate global sectorial strategy and policy that is imperative in aiding the gradual transition from the customary traditional agriculture towards a modern, technology-based one.

Coordination of the limited ongoing research in biotechnology in the present framework has been difficult within the non-sugar sector. In addition to the two tissue-culture laboratories, this sector is presently endowed with very few equipment facilities for basic biotechnology and molecular research. It is noted that even the existing facilities are not being optimally utilised firstly owing to a lack of a demand-driven and service-oriented strategy within the sector. Secondly, the existing equipment are scattered in the various institutions which are often being shared on an advance booking basis. However, this concept of sharing of equipment facilities poses several practical inconveniences and is often accompanied by a problem of accessibility at appropriate times, thus leading to enormous delays in the execution of projects, over and above a problem of coordination and monitoring.

Biotechnology has broad applications particularly relevant to our agricultural sector, which however necessitates specialised skills and support services for its proper implementation. However, in addition to the specialised expertise that it calls for, the strong infrastructural and technical amenities it requires are presently non-existent. For instance, as an example, genetic transformation, which is a promising futuristic tool for agriculture, requires specific logistics for its application such as appropriate infrastructure for confined trials prior to release, which are presently lacking. Until and
unless such logistics are set in place, it will be impossible to contemplate undertaking such activities.

**Biotechnology is a heavy investment technology having cross cutting areas of application often necessitating common items of equipment.** In this regard, reinforcing existing institutions with individual biotechnology facilities would imply duplication of resources with very heavy financial implications. Furthermore, the available skilled human resource capacity at the Ministry to undertake biotechnology based research work is limited and needs to be reinforced if we are to address the present challenges within the sector through the application of biotechnology.

The objective is, therefore, to provide adequate and readily accessible research facilities and support services for all institutions involved in non-sugar research in a most cost-effective manner through the efficient pooling of existing resources, equipment and human, and within a framework that would ensure their judicious utilisation.

Taking all the above into consideration, it is obvious that the *centralisation of all activities pertaining to agricultural biotechnology research and application under one apex organisation endowed with the appropriate resources and amenities, would not only render these activities more time and cost-efficient by reducing the present inter-institutional dependency but will also ensure better efficiency in meeting established objectives within the sector.*

### 18.1.4 Proposed Strategy

To this effect, the Ministry is proposing to **set up a Mauritius Agricultural Biotechnology Institute (MABI)**. This Institute will provide a **solid infrastructural research base for high-tech research in agricultural biotechnology** through the
highly competent scientific skill base that it will be endowed with. The activities of this institute would focus on revita\ling the non-sugar sector through a concerted approach. This facility would serve as an umbrella institute for all organisations involved in agricultural research and would also provide an interactive interface between the academic, research and business platforms in this sector. Being endowed with the appropriate administrative, infrastructural, legislative and technical framework, the Institute would serve as a national resource base for high-tech research and application in agricultural biotechnology.

The Institute will also form the central body of the Food and Agricultural Cluster which is being proposed in Chapter 20. The Mauritius Agricultural Biotechnology Institute would provide the enabling environment for a demand-driven delivery of services and product development, through continuous interaction and encouraging participation from all major stakeholders. It will thus operate in an environment that would promote continuous feedback from all stakeholders, thus allowing the fine tuning of its activities. In parallel, a strong marketing support from the Marketing Intelligence Unit that is proposed to be set up under the Ministry as per Chapter 17 would play a key role in ensuring the proper utilisation of resources at the Institute to meet national and regional objectives.

The primordial objective of the MABI would be to address issues of national priority, in the first instance, with a view to meeting the needs of the local planting and farming community. The longer term objective is to make Mauritius emerge as a ‘Centre of Excellence’ for high calibre research and application of Biotechnology to agricultural development and to look into the possibility of commercialising R&D in agricultural biotechnology once the technology is properly mastered. The ultimate aim is to make Mauritius assume the role of a service provider and know-how disseminator in this field by acting as a regional hub and a regional nursery.
The main objectives of the Institute would be to:

(i) address priority weaknesses of the sector using modern technologies with a service orientation to the planting and farming community at large in the following respects:

a) provision of quality and high yielding planting materials (tissue cultured plantlets and hybrid seeds etc.)

b) use of molecular techniques for early and rapid disease diagnosis in both livestock and crop sectors;

c) production of novel varieties of crop plants and ornamentals with engineered desirable traits with more commercial attributes (disease resistance, enhanced yield etc.) through the use of the gene technology, amongst others;

d) characterisation of local varieties of crops and livestock breeds;

e) biological control of pests;

f) conservation of endangered and endemic species of flora; and,

g) production of vaccines against recurrent diseases inflicting the livestock sector.

(ii) Acting as a Centre of Excellence for high calibre research work as well as a training centre for:

a) conducting high level research work to provide a good technical back-up to agricultural activities of economic importance;

b) ongoing training of local staff as well as technicians of the region through local and foreign expertise; and,

c) enrolment of students of the University of Mauritius for academic research projects in fields of national priority.
(iii) Acting as a regional facility in the following respects:

a) training and human capacity building in agricultural biotechnology;
b) research facility;
c) acting as a regional nursery in the provision of high-quality planting material; and,
d) acting as a regional hub in the delivery of services and know-how in agricultural biotechnology.

Biotechnology can, however, only fulfill its objective as a catalyst to the sector provided the right strategy is established that would allow its sound integration within our existing agricultural system. In this respect, it is proposed to frame the strategy on the basis of:

(i) an appraisal of the present contribution of biotechnology to our agriculture;
(ii) an analysis of the most prominent problems within the sector both in crop production and in livestock areas; and,
(iii) an evaluation of the national priorities.

Such a strategy would ensure a proper priority setting and a more productive channeling of resources for a fruitful, target-oriented application of biotechnology. Considering the fact that biotechnology is a heavy investment technology, the above analyses would promote its judicious uptake.

18.1.5 Current status

A feasibility study has been carried out through Australian expertise. The project is already in its implementation phase.

A training programme has been established for the adequately qualified staff of the Ministry, on established priority areas, to cater for the future manning of the Institute. To this end, international collaboration for training assistance is being tapped.
Provision is being made to establish the necessary legislative framework that would be essential to sustain the future activities of the Institute. To this end, a Genetically Modified Organism Bill has been prepared and is soon to be finalised to provide for precautionary measures with regard to Biosafety issues. The Plants Act is being amended to include provisions for the protection of Plant Breeders Rights. Action is being initiated to provide for the protection of Intellectual Property Rights with regard to biotechnology inventions.

18.2 Food Technology

18.2.1 Overview

In the present context whereby concern is being increasingly raised with respect to consumer needs and safety, the need to ensure food safety and quality and protection of consumer health within the food sector has become an issue of paramount importance. With the coming into force of increasingly stringent international norms within the food sector, ensuring that food products have appropriate composition and meet regulatory standards is crucial.

Facilities for proper food analysis to ensure conformity to norms are almost non-existent which poses enormous problems particularly to the local agro-industrial sector. In the current system such analyses are effected in foreign laboratories which not only involves exorbitant financial implications but also is very time consuming and cause enormous delays in activities.

18.2.2 Objective
To this end, the Ministry is envisaging to set up a Food Technology Laboratory. This laboratory will be equipped with the finest sophisticated technologies which will serve as a rapid service provider to various stakeholders involved within the food sector including importers, exporters, agro-industries as well as consumers at large. The main objectives of the laboratory would include:

(i) provision of a range of routine but essential tests with regard to food safety and quality;
(ii) timely and cost-effective analysis of food products of both animal and plant origin;
(iii) safeguard of imports of food items into Mauritius;
(iv) provision of the necessary analytical back up to product development; and,
(v) assistance to the local food processing industry and exporters of food commodities to ensure compliance to export requirements and international norms and in a timely manner.

18.3 Greenhouse cultivation, Hydroponic & Aeroponic Culture

18.3.1 Cultivation under Greenhouses

In Mauritius, cultivation has been traditionally an outdoor activity. Cultivation under controlled environment is a relatively recent concept, which however is gaining momentum. Cultivation under greenhouses offers enormous advantages as opposed to outdoor agriculture considering the fact that it allows better control over a number of parameters such as light, temperature, humidity, whilst at the same time offering a certain degree of protection against entry of pests, weeds and diseases. As a result, it contributes to limiting the use of chemical inputs which are otherwise
excessively used to control infestations in the common traditional outdoor
cultivation practices.

18.3.2 Hydroponic Culture

Hydroponic culture is being actively promoted amongst local
horticulturists involved in both vegetable and ornamental production.
Hydroponics involves soilless cultivation within a controlled environment, and as
a result harbours the numerous advantages of cultivation under greenhouses.
Such a culture, in addition to the advantages enumerated above, also offers the
possibility of cultivating in non-arable areas, hence optimising on space available for
agriculture. It also offers protection against a number of common soil borne diseases
whilst allowing an easier management of diseases. Taking into account the
inherent constraint of limited land availability for agricultural purposes,
hydroponics, which is an intensive cultivation technique, thus provides a
suitable means for the optimisation of output within limited cultivable land area.

Government has set in place various mechanisms with a view to promoting
the uptake of this novel cultivation technique.

Being conscious of the relatively high initial investment involved, Government has
set up a number of incentive schemes to encourage and assist producers in shifting from
the conventional practices towards more modern techniques of production. A soft loan
scheme at 3% interest rate at the Development Bank of Mauritius has been made
available to finance projects in Hydroponics. Duty exemption facilities have been
provided for acquisition of infrastructural and equipment items including irrigation
equipment involved in such projects.

On the technical aspect, Government has also looked into means of providing
technical guidance and necessary training to facilitate the adoption of this
technology by producers. Training workshops and courses are organised by the Ministry
of Agriculture to dispense necessary technical know-how in this field; extension services are provided by AREU to provide regular assistance and to monitor such projects on a regular basis. **Foreign collaboration has also been sought to provide expert technical assistance** to interested locals. For instance, expert assistance has been sought from the Government of the People’s Republic of China under the Agricultural Technical Cooperation Scheme in hydroponic culture with a view to providing professional services in this field. **The objective is to promulgate ‘Hydroponic’ as a soil-less culture and an intensive cultivation technique, to optimise on the systems and techniques that are most suitable for the local context through joint collaboration of local technicians, and to disseminate the know-how to interested local growers and entrepreneurs.** Project trials were initiated in 1998 at Belle Vue Experiment Station. Culture experiments on various vegetables and fruits namely tomato, cucumber, bitter gourd, lettuce, celery, muskmelon, cherry tomato etc. are carried out currently.

### 18.3.3 Aeroponic Culture

Aeroponics is another modern cultivation method that is being increasingly adopted in commercial cultivation practices. It is a form of hydroponic plant cultivation in which the plant roots are suspended in a closed chamber and misted with a complete nutrient solution. Aeroponics requires no solid aggregate growing medium and allows for easy access to the plant’s root system. The chamber and misting system provide complete control of the root zone environment, including temperature, nutrient level, pH, humidity, misting frequency and duration and oxygen availability. Plants under such a system usually exhibit accelerated growth and maturation. In this system the roots are briefly and periodically with nutritive solution, thus keeping the root area very well ventilated. This is why the plants obtain a well-developed root structure that allows considerable acceleration of plant growth without affecting the development of foliage, flowers or fruits.

Some of the advantages of aeroponic culture vs soil-based cultivation include:
(i) clean root material free of soil borne organisms or adulteration from foreign plant species contaminants;

(ii) accelerated cultivation cycles due to increased rate of growth and maturation;

(iii) potential for improved root yield and phytochemical consistency due to uniform nutrient and water availability and reduced risks of diseases;

(iv) higher plant density potential through elimination of water and nutrient competition;

(v) minimized use of nutrients and water due to recycling capability;

(vi) independence from local land and climatic conditions as it involves cultivation under controlled environment of a greenhouse;

(vii) precise control of root zone through manipulation of nutrient solution composition, temperature and application; and,

(viii) possible multiple root harvests of a single perennial crop.

These attributes have made aeroponics a popular research tool in plant nutrient uptake studies as well as a viable method for commercial cultivation of high value root crops, circumventing many of the difficulties associated with soil cultivation.

In view of the numerous advantages enunciated above and considering the need to intensify our production practices whilst at the same time minimising losses due to disease, it is proposed to investigate into the possibility of promulgating this cultivation technique. To this effect, it is proposed to conduct evaluation studies in order to assess the suitability and the potential of this technique in the local context with regard to certain crops of national priority such as potato.
18.3.4 Policy

Additionally, with a view to further promoting the adoption of modern cultivation practices by local producers, Government proposes to:

(i) provide good technical back-up for efficient transfer of technology to the field through the strengthening of extension services;

(ii) organise training programmes and workshops with a view to sensitising the planting community as to the potential benefits of the technology; and,

(iii) conduct a pilot project to investigate the technical and financial feasibility and suitability of aeroponics culture in Mauritius.

18.4 Information Technology in Agriculture

18.4.1 Overview

Being conscious of the role of Information and Communication Technology (ICT) in providing the necessary support to development of any sector, Government is placing great importance to promote the adoption of ICT. With vast application in a number of key economic sectors, ICT as an important component in establishing an agricultural information system, will also act as a major driver of agricultural development in Mauritius.
18.4.2 Setting up of an Agricultural Information System

The setting up of an agricultural information system has become vital in today’s context where easy and speedy access to information has become crucial. The agricultural information system would combine human, computer and communication based resources and will in turn result in efficient collection, storage, retrieval, communication and use of data. Such a system within the sector finds important roles at different levels in supporting development in agriculture.

At the Government level, the information system, by providing a clear indication of trends within the sector, would be vital in assisting in the formulation of plans and policies and the overall decision making process. This information system will allow regular access to such data that would help in the reviewing and readjustment of policies and plans with a view to channeling resources and targeting priority areas in a more productive manner. Such a system would also help Government to monitor the implementation of policies. The census for the whole agricultural sector proposed in Chapter 3 would be central in the successful establishment of this agricultural information system.

At the sectoral and institutional level, such information would enable better utilisation of data and information for efficient management of operations and planning of activities.

At the production level, timely and accurate data and information to producers and farmers on all aspects of production and marketing is absolutely vital. Such information is imperative if production is to be planned in an organised and structured manner to be in tune with the market needs and tendencies. In this respect, the agricultural information system will have a central role to play in determining the success of the agricultural sector.
18.4.3 Policy

In the light of the above, the following measures are proposed:

(i) The Ministry is aiming at establishing individual sectoral information system which will network with each other and will be linked to the centralised information system of the Ministry. The Ministry's information system will form the basis of a portal which producers and farmers and other interested parties can access to through direct internet. This portal would also aim at directing its users to other potential sources of information according to their needs.

(ii) It is proposed to carry out an information needs assessment, based on the objective and mandate of each institutions within the Ministry, to gauge the kind of data to be collected, stored and provided access to by potential users.

(iii) It is also proposed to create awareness among producers, farmers and other agricultural stakeholders as to the benefits that can be accrued from the use of ICT.

(iv) With a view to assisting producers and exporters in looking for market outlets and boost up export within the sector, it is proposed to set up a Market Information System (MIS), to be managed by the proposed Marketing Intelligence Unit as elaborated in Chapter 17, that would act as a national database for the horticultural sector. This database, on one hand, will help the stakeholders concerned to be more ICT literate and, on the other hand, will allow spontaneous access to market information on the export front.

The MIS will also have links with various markets across Mauritius and will give readily accessible information on sites of delivery and prices of commodities at various
markets. **This network, by providing speedy collection and dissemination of market information, would also potentially help in regulating prices at the national level and hence ensure a reasonable margin of profit to producers**, resolving the present difficulty encountered due to intermediaries.
19. RESEARCH & DEVELOPMENT

19.1 Overview

The role of research and technology transfer is primordial to spearhead the improvement in production and sustainability of the agricultural sector being aimed at. It is important to invest in strategic research and to build up the appropriate mechanism to coordinate demand-led research in a constructive framework to reach the above aim.

However, sustainability would require the sector to be its own driving engine. The agricultural sector should be financially self-reliant, to a certain extent, to better foster its further development and growth. Research and development, which is an important component for the growth of any agricultural sector of economic significance, requires considerable financial investment. In this context, the introduction of user-pay services would be the driving motor in sustaining proactive research and development and technology transfer initiatives. With such a system, the planting community and agricultural stakeholders at large would be responsibly involved in problem diagnosis and hence would assist in prioritisation of projects and programmes within the sector. It would foster a spirit of shared responsibility and benefits and would thus assist in the more appropriate channeling of resources with a demand-driven research framework.

19.2 Policy

In view of the above, it is proposed to:

(i) encourage private sector participation in the agricultural reform programme by devising a framework for a demand-led research and development programme; and,
(ii) encourage private sector involvement in the optimal use of existing facilities as well as future facilities to be provided by the proposed Mauritius Agricultural Biotechnology Institute and the proposed Food Laboratory.
20. CLUSTERING

20.1 Overview

In order to ensure optimal efficiency within the whole agricultural sector, it is imperative that activities be efficiently coordinated with proper sharing of information within a prompt responsiveness mechanism between all institutions involved within a sector. For productivity to be attained, it is essential to set up a framework that promotes utilisation of resources in an organised manner to meet established objectives. In this context, clustering provides an appropriate medium in triggering such a process.

20.2 Concept of Clustering

Clustering is a new concept worldwide which has proved itself in triggering a constructive synergy between various stakeholders within a system.

The concept of clustering of inter-related institutions through a central coordinating body has proved very effective in a number of countries in optimising the utilisation of resources and in the productive application of research findings to meet established objectives. There exists a successful model of this concept in the local textile industry, whereby members have managed to achieve better efficiency in their activity through a sharing of resources, whilst maintaining their competitiveness. Equally relevant to the agricultural sector, such a system would allow proper networking between partners and thus enable the merging of effort between all major players in the sector including the research, academic and business platforms. A clustering mechanism would provide a proactive interactive interface between the public and the private sectors fostering a spirit of shared responsibilities and benefits and will thus provide the basis for an organised channeling of resources for a more efficient, target-oriented and demand-driven service provision and product development. Such an interplay between stakeholders is
particularly vital for the agricultural sector which is frequently confronted to new challenges and thus relies heavily on prompt responses to problems encountered.

20.3 Policy

(i) Food & Agricultural Cluster

With a view to fostering a nation wide concept of a modern and well-organised agriculture involving active participation between all major players in the sector, Government proposes to create a cluster for the food and agricultural sector. This Food & Agricultural Cluster is proposed to be centred around the proposed Mauritius Agricultural Biotechnology Institute (see proposed structure at next page), under the aegis of the Ministry of Agriculture. Its primary objective would be to link all institutions falling under the Ministry with a view to promoting a coordinated approach among them, in order to avoid duplication of activities and to ensure a demand-oriented delivery of services and product development. This Cluster would also provide an interactive interface for all major players in the field for a proactive demand-oriented service provision with a view to rendering the sector more productive.

The proposed Food and Agricultural Cluster, by providing the framework to maximise the utilisation of resources and to capitalise on the strengths of the country within the sector, will also be a major driving force for Mauritius to achieve its long-term objective of a regional nursery and a regional agricultural and agro-processing hub.
Mauritius Agricultural Biotechnology Institute (MABI)

- Division of R&D
- Division of Plant Tissue Culture
- Division of Agricultural Diagnostics
- Division of Bioinformatics
- Division of Management Support

**Private Sector Participation**

- Farmers, Breeders, Planters
- Agro-industries
- Food Industry
- Market Intelligence

**End Users**
- Outputs to Consumers & End Users
- Start-up Companies
- Joint Ventures
- Entrepreneur - ship

**Regional and International Linkages**

**Legal, IP & Biosafety Framework**
(ii) **Agro-Industrial Cluster**

It is also proposed to set up a similar clustering mechanism to assist in the development of the local agro-industry. The objective is to regroup all institutions concerned, with a view to promoting networking between them, to achieving better efficiency in the sector. To this effect, it is proposed to set up an ‘**Agro-Industrial Cluster**’ comprising agro-industries, training and research institutions and all other support organisations that could participate efficiently towards the development of the local agro-industry.

This cluster, by allowing a more precise analysis of the needs and weaknesses of the sector on the basis of up-to-date information, would enable better monitoring of the sector as a whole towards higher productivity. Its role would be to foster cooperation among the parties concerned, promoting the sharing of resources and know-how wherever possible, whilst at the same time maintaining the specificity of each. Such a mechanism would give local entrepreneurs a better competitive advantage particularly at the export markets, and through an integrated effort, would promote an external competition with other countries for bigger markets shares instead of the present internal competition for the same markets.

With a lot of emphasis being laid in the strategic plan on the expansion of the local agro-industry, the proposed **Agro-Industrial Cluster** would play a crucial role in fostering an organised development strategy for this sector, which undoubtedly holds a lot of promises. The setting-up of this Cluster would be one of the priority tasks that would be assigned to the permanent joint Government/ private sector committee that is proposed to be established in Chapter 15, to look into the future of the local agro-industry.
21. TRAINING

21.1 Overview

In order to achieve the objective of the plan which, in essence, focuses on a gradual transition towards a high-tech agriculture away from the conventional practices, it becomes essential to inculcate a culture of professionalism amongst the major players engaged in the sector. Professionalism needs to be addressed at both the level of the technicians and farmers.

21.2 Importance of Training

The gist of this strategic plan which aims at agricultural development and modernisation will depend on a competent and committed human resource. Training in appropriate fields for human capacity building therefore becomes an essential integral component in the implementation of the plan. The country will require research scientists and technicians who are fully conversant with modern technologies of production as well as the appropriate social, communication and business skills for effective interaction with the variety of agricultural entrepreneurs.

Along with training of staff, farmer training and empowerment of agricultural entrepreneurs is highly required. Many of the small-scale farmers still lack the basic know-how of non-conventional agricultural practices and very few master the complexities of modern production methods and farm management. Strategies need to be devised to involve all players in the sector in participating in this reform process. Sustainability comes in the wake of continuous innovation and entrepreneurial attitudes. With respect to the latter, incentives should be devised to encourage young entrepreneurs to enter this sector.
Along this line, a sub-committee on ‘Training and Capacity Building’ was set up under the Ministry of Agriculture. This committee, in its report has come up with specific recommendations with a view to bridging the training gaps at various levels of participation essentially at farmer and entrepreneur level.

The reorientation of the sector with the proposed technology based approach is likely to attract foreign investments in the country. **Foreign companies will be encouraged to emerge in Mauritius within the food and agricultural sector to take advantage of the strategic position of Mauritius as well as its other comparative advantages in terms of technology and manpower resources**, which will generate new employment possibilities. Therefore, at all times the country has to be prepared academically to deliver the skills that would be required to sustain such development. The University of Mauritius which, as a prime supplier of manpower for local economic sectors, strives to draw a parallel between its strategic objectives and the national priorities, has already forecast such training needs within the educational system at postgraduate level. This parallel is constantly under review and the University presently offers a range of fields of study with a view to providing the required momentum for the agricultural modernisation process aimed at various levels of stakeholders. With regards to developing entrepreneurial skills, the University has on offer a ‘Certification in Entrepreneurship’ which aims at forming an entrepreneurial society.

21.3 Policy

With regard to the above, it is proposed to:

(i) establish a scheme such as the Young Agricultural Entrepreneurial Scheme (YAES) with incentives for young entrepreneurs to acquire agriculture-based training at all levels.
(ii) establish the training needs of staff in terms of scientific, social, and business skills and prepare an appropriate framework for staff development and training of agricultural stakeholders;

(iii) strengthen extension activities among agricultural entrepreneurs;

(iv) work in close collaboration with the University of Mauritius and the Industrial and Vocational Training Board (IVTB) in establishing priority fields of study in agriculture in tune with the training needs within the sector; and,

(v) devise specific tailor-made training programmes based on the needs of the planting and farming community.
22. LAND MANAGEMENT AND PHYSICAL DEVELOPMENT

22.1 Overview

The National Physical Development Plan, prepared as part of the National Environment Action Plan and approved by Government in 1993, has set out a planning strategy which should prove useful in any further economic development. Its basic concept is balanced development in compact settlement form which are two interlinked and interdependent strands. Balanced development implies, amongst others, balance of population distribution between the urban groupings and the four 'rural' regions, balance between work locations and residing region of the working population, between urbanisation and green areas, and between economic development and environmental protection. Compact settlement form implies that urban development should be focussed on larger settlements to make more efficient use of human, financial, economic, physical and social resources. This also implies that urban land uses will be developed so as to take only as much land as is required but will be of an integrated nature so as to enhance human development.

22.2 Agricultural Land

Presently, significant proportion of the island of Mauritius to the tune of over 70% is under agriculture and forest lands. In the coming years, incentives provided to restructure the sugar industry will result in significant land areas moving out of agriculture. It is therefore desirable to use a rational physical development plan to guide such land release while optimising short-term and long-term benefits. Furthermore as the sugar industry implements its mechanisation programme, the area presently leased to small planters for intercropping in the form of rotational land of non-sugar crops would be inevitably markedly reduced.
22.3 Land Management

A major concern that will need to be addressed is the conservation of fertile agricultural land and that of green landscapes. The country will therefore need a well-organised land management information system to reflect the status of land use among the different economic activities and specific to particular agricultural subsectors. With scarcity of fertile agricultural land resources in Mauritius, it is imperative that there is a continuous monitoring of the extent and type of both state and private lands available in each region, and how these are being used. At another level, maintenance of green landscapes should be given due attention. Natural places will be essential both for the social well-being of the Mauritian population and for development of green tourism.

The efficient use of remote sensing and global positioning techniques could strengthen the proposed land management information systems by ensuring effective monitoring of land use, and eventually helping the sustainable management of land and natural resources.

Due to high pressure for efficient land use, certain zones may be identified for particular activities. This will curtail cost of setting up infrastructure which may be shared among operators (e.g. electricity and water networks for running hydroponics projects), and in the case of livestock projects, it will avoid environmental problem that arise in the localisation of these projects while ensuring a proper waste management.

22.4 Policy

In regard to the above, it is proposed to:
(i) ensure that land conversion is done in a rational way in line with the National Physical Development Plan;

(ii) set up a task force to study and make recommendations with regard to the establishment of a land management information system; and,

(iii) reinforce the National Remote Sensing Centre with a view to rendering it fully functional and making optimal use of all its equipment facilities.
23. NATIONAL REMOTE SENSING CENTRE

23.1 Overview

Remote sensing technology is gaining impetus especially with increased emphasis being laid onto strategies for sustainable development.

The social and economic development of the country is still interlinked with its natural resources and with the manner in which they are managed and utilised. Area of cultivable land, water and biomass resources are currently under tremendous pressure in the context of highly competing and at times conflicting demands of the expanding population. Consequently, the resulting overexploitation and mismanagement of resources is exerting detrimental impact on the environment, often leading to various kinds of land and biomass degradation as well as water and air pollution. The challenge therefore lies in attempting to reverse the process of degradation. This is indispensable not only to meet the present but also the future needs of the people without jeopardising the ecosystem, i.e. ensuring sustainability.

Sustainable development, a term now widely used as a key word in resource management approach, implies natural resource management, which is both economically viable and environmentally sustainable in the long run. It emphasises on the optimal management of both land and water resources in such a way as to maintain a balance between productivity functions and conservation measures through identification and monitoring of problem areas that require alternate land use practices. This calls for a logistic view of the entire region and an integrated approach through understanding of various resources, their potential, mutual dependence and integration of this information along with the socio-economic data, to reach local specific solutions.
23.2 Objective of the National Remote Sensing Centre

The aim of the National Remote Sensing Centre is to develop strategies towards sustainable development for the optimal utilisation of natural resources of Mauritius. The way forward in reaching this objective is to have a proper and systematic inventory of the available resources by using the Remote Sensing Technology (spatial data) and other ancillary information in a Geographic Information System (GIS). Such information associated with area specific potential, problem and socio-economic constraints, would be useful in generating pragmatic site specific recommendations for a more orderly planning of agricultural development.

The major objectives in this regard are to:

(i) generate various thematic maps of natural resources on 1:250,000 scale in digital formats;
(ii) identify the potentials and problems of land, water and socio-economic parameters;
(iii) integrate various thematic information and socio-economic data for generation of action plans; and,
(iv) generate a comprehensive plan for:

• Watershed Development Planning
• Land Capability and Land Irrigability Analysis
• Land use Change Analysis
• Water Resource Development Planning
• Environmental Impact Analysis
• Monitoring of development programmes
• Index analysis of development at national/district level
• Spatial representation of non-spatial data of demography, occupation structure, etc
• To bring local participation into the plan by holding meetings with the farmers and officials as part of the awareness programme and also for the speedy implementation of various schemes

23.3 Policy

In order to assist the National Remote Sensing Centre in achieving its objectives, it is proposed to:

(i) look into the possibility of hiring a consultant for the conceptual design, implementation and validation of the project for a total period of 12 months spread over three years;

(ii) provide funds for the purchase of satellite data (approximate cost - Rs 600,000);

(iii) train existing staff in the latest technologies;

(iv) upgrade existing software and hardware;

(v) enroll multidisciplinary scientists; and,

(vi) investigate into the possibility of setting up a ground receiving station for continuous availability of satellite data to assist in the continuous updating of the Natural Resource Information System.
24. INSTITUTIONAL FRAMEWORK

24.1 Overview

In line with the general policy of the plan to efficiently re-structure the whole agricultural set-up, it is felt that the institutional framework within which services are provided also urgently needs to be revisited.

With a view to ensuring productivity within the agricultural sector, it is essential that the support institutions fulfill their respective roles in an efficient manner. To this effect, it is imperative to ensure:

(i) adherence to the initial objectives and mandate of each institution;
(ii) prevention of duplication of activities;
(iii) proper and close monitoring of activities & projects;
(iv) efficient delivery of services & research findings to the ultimate beneficiaries; and,
(v) proactive endeavours, with a demand-driven and target-oriented approach.

24.2 General Services

Agricultural services

The Agricultural Services of the Ministry, situated at Reduit comprises the following divisions:
(a) Plant Pathology
(b) Entomology
(c) Agronomy
(d) Dairy Chemistry Laboratory
(e) Engineering
(f) Land Use
(g) Animal Production and the Veterinary Services
These divisions operate in close collaboration towards the enhancement of food production and security in a sustainable manner and, to this effect, provide the following main services to the agricultural community:

(i) advice on land use and agricultural projects;
(ii) plant protection services, pest and disease control; and,
(iii) veterinary care and livestock services.

Over the years, the Agricultural Services have diverged away from their initial research and extension orientation, increasingly assuming the role of a facilitator in dispensing the following services:

(i) Provision of essential inputs;
(ii) Improvement and safeguard of plant and animal health;
(iii) Land resource management;
(iv) Agricultural development and support programmes;
(v) Provision of regulatory framework; and,
(vi) Market research/Intelligence to a certain extent.

**Agricultural Research & Extension Unit (AREU)**

The research and extension mandate within agriculture including livestock, formerly falling under the purview of the Agricultural Services, was entrusted to the AREU since its inception in July 1995 from the Directorate of Agricultural Research and Extension (DARE) following the relocation of the latter’s activities to the Food and Agricultural Research Council (FARC).

It was created to facilitate Government's goals of improving the productivity of the farming community and diversifying production.
In addition to the above two organisations, there exist twelve other institutions falling under the aegis of the Ministry, five of which play key roles within the non-sugar agricultural sector.

Food and Agricultural Research Council (FARC)

The FARC was set up in 1985 with the mandate of coordination and harmonisation of research in non-sugar crops, livestock and food production. It has the AREU operating under its aegis which is responsible for the extension and research services.

Agricultural Marketing Board (AMB)

The AMB was set up in 1963. It regulates and supplies potatoes, onions, spices, garlic and fresh milk on the local market. The main objectives of the AMB are to encourage local production through a guaranteed price, to market the controlled products, to ensure their regular supply and to regulate their prices on the local market.

Irrigation Authority (IA)

The IA was set up in 1979 with the mandate of studying the development of irrigation and of implementing and managing schemes for irrigation.

Mauritius Meat Authority (MMA)

The MMA was set up in 1974 to:

(i) establish and manage abattoirs;
(ii) purchase and import livestock for slaughter;
(iii) market meat and by products;
(iv) control and regulate the sale of meat; and,
(v) fix the price of meat and meat products on the local market.

**Tobacco Board**

The Tobacco Board was established in 1932 with the main function of controlling the production and marketing of tobacco in Mauritius.

### 24.3 Objective

Although from their respective mandates, each institution appears to have clear-cut individual objectives, certain overlapping of activities have been observed. Therefore, the objective of the proposed restructuring process is to ensure a proper distribution of tasks between the interrelated institutions operating under the aegis of the Ministry with a view to avoiding duplication of activities and ensuring a better and more productive utilisation of resources.

A similar process recently carried out within the sugar sector with a view to meeting the objectives of the Sugar Sector Strategic Plan has proved to be very useful in addressing some of the most pressing problems of the sector. The aim is now to extend this process to the non-sugar sector. Such an exercise, with the aim of rendering individual institutions more efficient in their respective tasks and services, would enable better coordination and monitoring and would thus ensure that the objectives of the plan are met within the scheduled timeframe.
24.4 Policy

In this respect, it is proposed to set up an ‘Institutional Review Taskforce’ that will have the responsibility of looking into the present operational aspects of individual institutions falling under the aegis of this Ministry, identifying existing weaknesses and making recommendations for remediation in line with the objectives of the plan.

Priority Institutions

Along the same line, in view of their respective mandates and recent changes in the sectors concerned, the following two institutions have been identified as the ones to be reviewed with utmost priority.

(i) Agricultural Marketing Board (AMB)

The AMB currently offers services in the following respects:-

(i) importation of potatoes and onions;
(ii) provision of storage facility to local producers & importers;
(iii) collection and sale of fresh milk; and,
(iv) other side activities including sale of spices.

However, in view of the current changes within the sector and the ongoing regionalisation process, it is felt that the AMB requires additional facilities in terms of equipment, cold room, human resources etc, to become an institution of excellence both in terms of product planning and marketing.

Taking into account, threats and uncertainties at the international level, it is primordial that food security becomes an integral part of any responsible Government's
agricultural policy. In that respect, the AMB has a key role to play. Marketing is to become a major activity of the AMB. The success of any agricultural strategy depends on the effectiveness of the marketing system in place.

It is proposed that the Marketing Intelligence Unit as stated in Chapter 17, be set-up as a specific unit under the aegis of the AMB. The Unit will act as a major bridge between the producer and the market and would be expected to play a proactive role in order to fine tune production according to the market needs whether at the local or international level, in collaboration with the other research, extension and implementation divisions of the Ministry of Agriculture. This unit will bear the responsibility of:

(i) acting as an interface between the producer and the market;
(ii) assessing market needs at the local and international level for locally produced agricultural commodities;
(iii) provision of up to date market information and other required scientific data to the planting community;
(iv) constitution of a full fledged database regarding production, market needs; new tendencies, seasonal variations with continuous updating;
(v) advising the planting community on the planning of plantation on the basis of climatic, geographical and seasonal suitability in addition to market tendency, through close collaboration with AREU and other research institutions; and,
(vi) continuously analyse present markets trends, local, regional and international, to be in a position to seize all possible opportunities.

The role of the AMB in milk collection and sale under the Small Cowkeepers Scheme, requires a new approach. So far, AMB has been collecting
milk from around 2000 small cowkeepers. The milk is entrusted to a private dairy plant for pasteurisation prior to distribution to supermarkets and other points of sale.

The activity which is highly subsidised by Government has proved to be non-profitable altogether. However, taking into account social considerations, it is not proposed to do away with the Small Cowkeepers Scheme. Instead, the aim is to look into ways to achieve a certain degree of cost-effectiveness in this activity. To attain this objective, it is proposed that AMB collects milk produced at all livestock stations of the Ministry, to undertake the appropriate processing.

Several queries have been raised regarding compliance to norms and hygienic standards raised at the private dairy plant which currently effects processing and packing of the milk sold by AMB. In view of the above, it is proposed that this activity be reviewed.

In the present context whereby compliance to quality and hygienic norms is assuming a big dimension, it is important that this activity be carried out within a safe and healthy environment. To this effect, it is proposed that the AMB looks into the issue and works out a strategy either to undertake milk processing at its own level or in joint venture with a private organisation to generate a value added product. The aim is to derive maximum profitability out of the locally produced fresh milk whilst minimising current wastage recorded especially at the livestock stations where milk production is currently undertaken as a side activity.

To this end, prior to embarking in this endeavor, it is proposed that a feasibility study be conducted.
(ii) **Tobacco Board**

The Tobacco Board was set up in 1932 under the Tobacco Production & Marketing Ordinance of 1930. Its main function is to **control the production and marketing of tobacco in Mauritius by acting as a regulator of leaf production through a quota system and its subsequent marketing through its central warehouse** where all leaf produced locally are purchased, processed, stored and sold to the manufacturer(s).

As a body corporate, the Tobacco Board is a non-profit organisation but self-finances both its recurrent and capital expenditures by deriving its income mainly from mark-up on the purchase price and a cess on domestic leaf tobacco. The mark-up charged on purchase prices of leaf generates the major part of the revenue needed to cover the financial obligations of the Board with no financial grant from Government.

The Tobacco Board hence effectively operates as an apex organisation of the tobacco sector which generates a significant amount of tax earnings amounting to about Rs 1.5 billion in 2000-2001 to Government. It has, in that connection, recently been empowered with new regulatory functions for the licensing of imports of tobacco (leaf) and manufactured tobacco (cigarettes, cigars etc). With trade liberalisation, this institution will be called upon to take up new regulatory functions such as the monitoring of nicotine, tar etc. contents of cigarettes and also the labelling of cigarette boxes, for which it should be adequately equipped to undertake.

In view of the current difficulties facing the tobacco sector, with *inter-alia* increasing health awareness and diminishing volume of local production, the Tobacco Board needs to gear its activities to suit the new environment, including the need to encourage the production of appropriate tobacco varieties. As a regulator, the
Tobacco Board is expected to become more stringent on standards and ensure a level playing field for the local producers and importers.

It is felt that the present quota system contains some flaws which need to be addressed in consultation with the present quota holders and interested new entrants in this field.

In light of the present circumstances in the tobacco industry, the following are recommended:

(i) strengthen the regulatory powers of the Tobacco Board, in view of the increasing vulnerability of the domestic tobacco industry with liberalisation of the market; and,

(ii) review the organisational structure of the Board.
25. CONCLUSION

There is no doubt that the future of the Mauritian agriculture depends largely on its reorientation with a new technology-based dimension, in light of the high level of competition and challenges within the sector, coupled with the massive technological development being fostered by Government in all spheres. This concept in fact, forms the basis of this strategic plan for the non-sugar sector.

This plan has been conceived with the intention of laying the foundation for this re-orientation process, with a view to achieving the objective of Government, of a ‘modern-agriculture’.

The plan is being projected for the next five years, i.e. 2003-2007, and incorporates a series of measures, specifically framed on a sector and subsector basis, to meet the above objective. All the proposed measures have been judiciously worked out following an in-depth technical analysis, as well as necessary consultations with the stakeholders concerned, to ensure optimal benefits to all.

In order to meet the objectives of the strategic plan, it is also essential to set up the necessary mechanism to ensure its proper implementation. To this effect, a ‘Non-Sugar Sector Strategic Plan High-Powered Committee’ will be set up, which will have the responsibility of ensuring the proper and timely execution of the provisions of the plan, with a view to achieving the expected outcome within the scheduled timeframe.

The Agricultural Policy Unit of the Ministry of Agriculture will have a determining role to play in the monitoring of the implementation process. A mid-term review is projected for the year 2005. This review will allow a general assessment of the achievements of the implementation process with respect to the objective of the plan, and will accordingly provide the basis for any fine-tuning and readjustment of proposed policy measures that may be required to be in line with developments in the sector. The findings of this review will provide good indications of the success of the proposed reorientation process and the extent to which identified weaknesses have been
successfully tackled. It will accordingly serve as a good base in setting the scene for future projections within the agricultural sector, especially in terms of volume of production and productivity within the various sectors and subsectors including, *inter-alia*, the foodcrop, ornamental and livestock sectors.

It is believed that by the year 2007, Mauritius would be able to visually witness a remarkable transition into a new agricultural era based on modern practices, and the way to making Mauritius assume its role as a regional nursery and regional agro-processing hub would be paved.
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<td>8,373</td>
<td>22.20</td>
<td>6,453</td>
<td>17.10</td>
</tr>
<tr>
<td>FPZ and other non agricultural</td>
<td>23,510</td>
<td>73.70</td>
<td>28,117</td>
<td>74.40</td>
<td>29,332</td>
<td>77.80</td>
<td>31,373</td>
<td>82.90</td>
</tr>
<tr>
<td>Industry Group</td>
<td>1998</td>
<td>1999&lt;sup&gt;1&lt;/sup&gt;</td>
<td>2000&lt;sup&gt;2&lt;/sup&gt;</td>
<td>2001&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-------</td>
<td>------------------</td>
<td>------------------</td>
<td>------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, hunting, forestry and fishing</td>
<td>9,165</td>
<td>6,267</td>
<td>7,898</td>
<td>8,565</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugarcane and sugar manufacture</td>
<td>(6,119)</td>
<td>(3,148)</td>
<td>(4,496)</td>
<td>(5,065)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>(3,046)</td>
<td>(3,119)</td>
<td>(3,402)</td>
<td>(3,500)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>125</td>
<td>134</td>
<td>142</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing (excluding sugar)</td>
<td>19,560</td>
<td>21,877</td>
<td>23,850</td>
<td>26,340</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity, gas and water</td>
<td>1,519</td>
<td>1,299</td>
<td>1,679</td>
<td>2,205</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>4,886</td>
<td>5,515</td>
<td>6,108</td>
<td>6,355</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: CSO - Digest of Statistics

Table 1B: Gross Domestic Product by industry group at current basic prices (Million Rupees)
<table>
<thead>
<tr>
<th>Sector</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale &amp; retail trade</td>
<td>11,189</td>
<td>12,292</td>
<td>13,327</td>
<td>14,500</td>
</tr>
<tr>
<td>Hotels and restaurants</td>
<td>4,922</td>
<td>5,703</td>
<td>5,988</td>
<td>6,530</td>
</tr>
<tr>
<td>Transport, storage and communication</td>
<td>10,383</td>
<td>11,678</td>
<td>13,487</td>
<td>15,380</td>
</tr>
<tr>
<td>Financial intermediation</td>
<td>6,612</td>
<td>7,611</td>
<td>9,110</td>
<td>11,010</td>
</tr>
<tr>
<td>Real estate, renting and business activities</td>
<td>7,494</td>
<td>8,379</td>
<td>9,327</td>
<td>10,445</td>
</tr>
<tr>
<td>Public administration and defense compulsory social security</td>
<td>5,767</td>
<td>6,421</td>
<td>6,982</td>
<td>7,495</td>
</tr>
<tr>
<td>Education</td>
<td>3,795</td>
<td>4,261</td>
<td>4,670</td>
<td>5,105</td>
</tr>
<tr>
<td>Health and social work</td>
<td>2,375</td>
<td>2,770</td>
<td>2,993</td>
<td>3,225</td>
</tr>
<tr>
<td>Other services</td>
<td>3,183</td>
<td>3,573</td>
<td>4,001</td>
<td>4,490</td>
</tr>
<tr>
<td>FISIM</td>
<td>-2,782</td>
<td>-3,011</td>
<td>-3,500</td>
<td>-4,000</td>
</tr>
<tr>
<td><strong>Gross Domestic Product at basic prices</strong></td>
<td><strong>88,193</strong></td>
<td><strong>94,769</strong></td>
<td><strong>106,062</strong></td>
<td><strong>117,795</strong></td>
</tr>
<tr>
<td><strong>Taxes on products (net of subsidies)</strong></td>
<td><strong>12,020</strong></td>
<td><strong>13,993</strong></td>
<td><strong>15,446</strong></td>
<td><strong>17,000</strong></td>
</tr>
<tr>
<td><strong>Gross Domestic Product at market prices</strong></td>
<td><strong>100,213</strong></td>
<td><strong>108,762</strong></td>
<td><strong>121,508</strong></td>
<td><strong>134,795</strong></td>
</tr>
</tbody>
</table>

Source: CSO – Digest of Statistics

*Revised estimates  Preliminary estimates  First forecast

**Table 1C:** The Contribution to GDP of different Agricultural Subsectors in 2000 (excl. fisheries)
## Table 1D: The Share of the different Subsectors to Agricultural Exports in 2000 (excl. fisheries)

<table>
<thead>
<tr>
<th>Subsectors</th>
<th>2000</th>
<th>Exports (FOB million Rs)</th>
<th>% of Total Agricultural Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugarcane</td>
<td>3557.0</td>
<td>5584.2</td>
<td>86.5</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Foodcrops (excl. fruits)</td>
<td>36,500</td>
<td>59,600</td>
<td>59,000</td>
</tr>
<tr>
<td>Beef</td>
<td>455</td>
<td>587</td>
<td>450</td>
</tr>
<tr>
<td>Goat and Mutton</td>
<td>140</td>
<td>146</td>
<td>82</td>
</tr>
<tr>
<td>Pork</td>
<td>600</td>
<td>541</td>
<td>829</td>
</tr>
<tr>
<td>Venison</td>
<td>240</td>
<td>250</td>
<td>425</td>
</tr>
<tr>
<td>Poultry</td>
<td>5750</td>
<td>6000</td>
<td>12,500</td>
</tr>
</tbody>
</table>

Source: CSO – Digest of Statistics

Table 1E: Trend in Production for Foodcrop and Livestock Subsectors (in Tonnes)
Milk (1,000 litres) | 8400 | 10,700 | 11,000 | 7500 | 4000 | 4,000

Source: CSO – Digest of Statistics

NA: Not Available

Table 1F: Evolution in Food Imports (1995 - 2000)

![Graph showing the evolution of food imports from 1995 to 2000]

Source: Mauritius Chamber of Agriculture

Table 2A: Trend in Foodcrop Production (excl. fruits) over the past five years

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (tonnes)</td>
<td>83,897</td>
<td>77,269</td>
<td>90,326</td>
<td>80,813</td>
<td>77,519</td>
<td>102,568</td>
<td>129,119</td>
</tr>
<tr>
<td>Area Harvested (hectares)</td>
<td>6,153</td>
<td>5,891</td>
<td>6,345</td>
<td>6,454</td>
<td>5,619</td>
<td>6,789</td>
<td>7,918</td>
</tr>
</tbody>
</table>

Source: Mauritius Chamber of Agriculture
<table>
<thead>
<tr>
<th>Commodities</th>
<th>1996</th>
<th>1998</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot</td>
<td>3141</td>
<td>3363</td>
<td>11,461</td>
</tr>
<tr>
<td>Onion</td>
<td>6067</td>
<td>6727</td>
<td>11,134</td>
</tr>
<tr>
<td>Cabbage</td>
<td>7585</td>
<td>6283</td>
<td>10,823</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>3425</td>
<td>4260</td>
<td>2045</td>
</tr>
<tr>
<td>Chillies (long + curry)</td>
<td>874</td>
<td>941</td>
<td>775</td>
</tr>
<tr>
<td>Chillies (small)</td>
<td>160</td>
<td>119</td>
<td>130</td>
</tr>
<tr>
<td>Ginger</td>
<td>784</td>
<td>420</td>
<td>498</td>
</tr>
<tr>
<td>Garlic</td>
<td>235</td>
<td>131</td>
<td>46</td>
</tr>
<tr>
<td>Green peas</td>
<td>15</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: CSO – Digest of Statistics

Table 2B: Trend in Production of certain Foodcrop Commodities (tonnes)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Beans (green)</td>
<td>1,861</td>
<td>2,393</td>
<td>1,883</td>
<td>1,294</td>
<td>1,708</td>
<td>2,006</td>
</tr>
<tr>
<td>Beet (red)</td>
<td>853</td>
<td>490</td>
<td>332</td>
<td>658</td>
<td>1,794</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: CSO – Digest of Statistics

Table 2C: Production of Vegetable (tonnes) - 1996 to 2000
<table>
<thead>
<tr>
<th>Vegetable</th>
<th>840</th>
<th>762</th>
<th>777</th>
<th>427</th>
<th>805</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bittergourd</td>
<td>2,458</td>
<td>107</td>
<td>2,237</td>
<td>1,713</td>
<td>2,160</td>
<td>2,721</td>
</tr>
<tr>
<td>Eggplant</td>
<td>N.A</td>
<td>N.A</td>
<td>N.A</td>
<td>36</td>
<td>93</td>
<td>NA</td>
</tr>
<tr>
<td>Broccoli</td>
<td>4,156</td>
<td>4,959</td>
<td>3,713</td>
<td>3,027</td>
<td>4,586</td>
<td>NA</td>
</tr>
<tr>
<td>Cabbage</td>
<td>3,141</td>
<td>4,878</td>
<td>3,363</td>
<td>6,127</td>
<td>11,461</td>
<td>NA</td>
</tr>
<tr>
<td>Marrow</td>
<td>3,425</td>
<td>3,261</td>
<td>4,260</td>
<td>1,274</td>
<td>2,045</td>
<td>1,845</td>
</tr>
<tr>
<td>Carrot</td>
<td>874</td>
<td>690</td>
<td>941</td>
<td>694</td>
<td>775</td>
<td>NA</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>160</td>
<td>155</td>
<td>119</td>
<td>101</td>
<td>130</td>
<td>NA</td>
</tr>
<tr>
<td>Chayotte</td>
<td>1,692</td>
<td>3,113</td>
<td>3,392</td>
<td>4,506</td>
<td>5,271</td>
<td>NA</td>
</tr>
<tr>
<td>Cucumber</td>
<td>4,581</td>
<td>5,714</td>
<td>4,573</td>
<td>4,187</td>
<td>6,046</td>
<td>NA</td>
</tr>
<tr>
<td>Echarlotte (green onion)</td>
<td>N.A</td>
<td>N.A</td>
<td>596</td>
<td>300</td>
<td>630</td>
<td>NA</td>
</tr>
<tr>
<td>Eddoes (violet)</td>
<td>75</td>
<td>54</td>
<td>45</td>
<td>20</td>
<td>48</td>
<td>NA</td>
</tr>
<tr>
<td>Eddoes (curry)</td>
<td>50</td>
<td>62</td>
<td>60</td>
<td>67</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Garlic</td>
<td>235</td>
<td>82</td>
<td>131</td>
<td>38</td>
<td>46</td>
<td>40</td>
</tr>
<tr>
<td>Ginger</td>
<td>784</td>
<td>317</td>
<td>420</td>
<td>116</td>
<td>498</td>
<td>868</td>
</tr>
<tr>
<td>Groundnut</td>
<td>767</td>
<td>863</td>
<td>551</td>
<td>341</td>
<td>408</td>
<td>323</td>
</tr>
<tr>
<td>Leek</td>
<td>24</td>
<td>57</td>
<td>23</td>
<td>97</td>
<td>263</td>
<td>NA</td>
</tr>
<tr>
<td>Lettuce</td>
<td>1,670</td>
<td>2,223</td>
<td>1,878</td>
<td>1,223</td>
<td>1,716</td>
<td>NA</td>
</tr>
<tr>
<td>Okra</td>
<td>633</td>
<td>647</td>
<td>634</td>
<td>459</td>
<td>814</td>
<td>NA</td>
</tr>
<tr>
<td>Maize</td>
<td>438</td>
<td>232</td>
<td>260</td>
<td>201</td>
<td>623</td>
<td>389</td>
</tr>
<tr>
<td>Tapioca</td>
<td>140</td>
<td>200</td>
<td>165</td>
<td>111</td>
<td>151</td>
<td>NA</td>
</tr>
<tr>
<td>Onion</td>
<td>6,067</td>
<td>5,036</td>
<td>6,727</td>
<td>9,066</td>
<td>11,134</td>
<td>10,950</td>
</tr>
<tr>
<td>Snake gourd</td>
<td>705</td>
<td>690</td>
<td>756</td>
<td>342</td>
<td>789</td>
<td>NA</td>
</tr>
<tr>
<td>Chinese Cabbage</td>
<td>1,579</td>
<td>2,391</td>
<td>2,246</td>
<td>1,593</td>
<td>3,481</td>
<td>NA</td>
</tr>
<tr>
<td>Ridge gourd</td>
<td>1,368</td>
<td>1,609</td>
<td>1,467</td>
<td>607</td>
<td>1,231</td>
<td>NA</td>
</tr>
<tr>
<td>Potato</td>
<td>10,639</td>
<td>17,584</td>
<td>14,612</td>
<td>15,322</td>
<td>13,843</td>
<td>16,350</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>7,021</td>
<td>6,455</td>
<td>5,429</td>
<td>4,040</td>
<td>5,113</td>
<td>NA</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Squash</td>
<td>758</td>
<td>1,468</td>
<td>1,056</td>
<td>2,136</td>
<td>2,683</td>
<td>NA</td>
</tr>
<tr>
<td>Sweet pepper (capsicum)</td>
<td>71</td>
<td>142</td>
<td>16</td>
<td>2</td>
<td>45</td>
<td>NA</td>
</tr>
<tr>
<td>Tomato</td>
<td>10,877</td>
<td>12,226</td>
<td>10,729</td>
<td>8,037</td>
<td>9,719</td>
<td>12,395</td>
</tr>
<tr>
<td>Cowpeas</td>
<td>967</td>
<td>923</td>
<td>1,248</td>
<td>751</td>
<td>911</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>76,504</td>
<td>87,681</td>
<td>80,924</td>
<td>77,112</td>
<td>101,910</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Source:** CSO – Digest of Statistics

NA: Not Available

Table 2D: Exports of Vegetables (tonnes)
<table>
<thead>
<tr>
<th>FOODCROP</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area Harvested (hectares)</td>
<td>Production (tonnes)</td>
<td>Area Harvested (hectares)</td>
</tr>
<tr>
<td>ONION</td>
<td>305</td>
<td>6,727</td>
<td>315</td>
</tr>
<tr>
<td>TOMATO</td>
<td>1,040</td>
<td>10,729</td>
<td>777</td>
</tr>
<tr>
<td>POTATO</td>
<td>830</td>
<td>14,612</td>
<td>639</td>
</tr>
</tbody>
</table>

Source: AREU/CSO
Table 2F: AREA harvested and production of Potatoes by district for 1996 - 2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area</td>
<td>Production</td>
<td>Area</td>
<td>Production</td>
<td>Area</td>
</tr>
<tr>
<td></td>
<td>hectare</td>
<td>tonnes</td>
<td>hectare</td>
<td>tonnes</td>
<td>hectare</td>
</tr>
<tr>
<td>Rivière du Rempart</td>
<td>40.5</td>
<td>872</td>
<td>76.2</td>
<td>1,075</td>
<td>43.7</td>
</tr>
<tr>
<td>Pamplemousses</td>
<td>47.5</td>
<td>782</td>
<td>66.5</td>
<td>1,182</td>
<td>92.3</td>
</tr>
<tr>
<td>Moka</td>
<td>193.7</td>
<td>3,261</td>
<td>199.5</td>
<td>5,262</td>
<td>293.1</td>
</tr>
<tr>
<td>Flacq</td>
<td>11.8</td>
<td>168</td>
<td>14.7</td>
<td>206</td>
<td>40.5</td>
</tr>
<tr>
<td>Black River</td>
<td>67.1</td>
<td>1,590</td>
<td>103.8</td>
<td>2,452</td>
<td>41.5</td>
</tr>
<tr>
<td>Plaine Wilhems</td>
<td>23.6</td>
<td>469</td>
<td>132.3</td>
<td>2,310</td>
<td>113.3</td>
</tr>
<tr>
<td>Grand Port</td>
<td>16.8</td>
<td>397</td>
<td>23.2</td>
<td>440</td>
<td>65.3</td>
</tr>
<tr>
<td>Savanne</td>
<td>142.1</td>
<td>3,100</td>
<td>199.0</td>
<td>4,657</td>
<td>140.0</td>
</tr>
<tr>
<td>Whole Island</td>
<td>543.1</td>
<td>10,639</td>
<td>815.2</td>
<td>17,584</td>
<td>829.7</td>
</tr>
</tbody>
</table>

Source: Agricultural Research & Extension Unit (AREU)
Table 2G: **Imports of Potato Seeds - Volume & Amount**

<table>
<thead>
<tr>
<th>Year</th>
<th>Volume (Tonnes)</th>
<th>Amount C&amp;F (Rs)</th>
<th>Average Cost/ Tonne C&amp;F (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>1,383</td>
<td>12,931,050</td>
<td>9,350</td>
</tr>
<tr>
<td>1996</td>
<td>904</td>
<td>10,848,000</td>
<td>12,000</td>
</tr>
<tr>
<td>1997</td>
<td>1,219</td>
<td>16,273,650</td>
<td>13,350</td>
</tr>
<tr>
<td>1998</td>
<td>1,631</td>
<td>24,709,650</td>
<td>15,150</td>
</tr>
<tr>
<td>1999</td>
<td>1,120</td>
<td>18,032,000</td>
<td>16,100</td>
</tr>
<tr>
<td>2000</td>
<td>1,014</td>
<td>18,388,890</td>
<td>18,135</td>
</tr>
<tr>
<td>2001</td>
<td>1,105</td>
<td>20,586,150</td>
<td>18,630</td>
</tr>
</tbody>
</table>

Source: Agricultural Marketing Board

Table 2H: **Imports of Table Potato - Volume & Amount**

<table>
<thead>
<tr>
<th>Year</th>
<th>Volume (Tons)</th>
<th>Amount C&amp;F (Rs)</th>
<th>Average Cost/ Ton C&amp;F (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>8,040</td>
<td>44,613,960</td>
<td>5,549</td>
</tr>
<tr>
<td>1996</td>
<td>10,505</td>
<td>72,799,650</td>
<td>6,930</td>
</tr>
<tr>
<td>1997</td>
<td>10,185</td>
<td>78,292,095</td>
<td>7,687</td>
</tr>
<tr>
<td>1998</td>
<td>8,983</td>
<td>83,532,483</td>
<td>9,351</td>
</tr>
<tr>
<td>1999</td>
<td>6,667</td>
<td>58,522,926</td>
<td>8,778</td>
</tr>
<tr>
<td>2000</td>
<td>7,021</td>
<td>66,980,340</td>
<td>9,540</td>
</tr>
<tr>
<td>2001</td>
<td>8,780</td>
<td>78,142,000</td>
<td>8,900</td>
</tr>
</tbody>
</table>

Source: Agricultural Marketing Board

Table 2I: **Imports of Table Potato - Volume & Amount**

<table>
<thead>
<tr>
<th>Year</th>
<th>Volume (Tonnes)</th>
<th>Amount C&amp;F (Rs)</th>
<th>Average Cost/ Tonne C&amp;F (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>744</td>
<td>27,379,200</td>
<td>36,800</td>
</tr>
<tr>
<td>1999</td>
<td>983</td>
<td>42,170,700</td>
<td>42,900</td>
</tr>
<tr>
<td>2000</td>
<td>1,162</td>
<td>50,430,800</td>
<td>43,400</td>
</tr>
</tbody>
</table>

Source: Agricultural Marketing Board
Table 3A:

**ONION: Volume of Local Production, Imports and Per Capita Consumption**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Production</td>
<td>6,067</td>
<td>5,036</td>
<td>6,727</td>
<td>9,066</td>
<td>11,485</td>
<td>10,172</td>
</tr>
<tr>
<td>Importation</td>
<td>5,362</td>
<td>6,203</td>
<td>7,232</td>
<td>9,310</td>
<td>7,762</td>
<td>8,476</td>
</tr>
<tr>
<td>Per Capita Consumption Kg/yr</td>
<td>11.28</td>
<td>12.63</td>
<td>12.82</td>
<td>14.7</td>
<td>15.7*</td>
<td>15.5*</td>
</tr>
</tbody>
</table>

*: Estimated values

Source: Agricultural Research & Extension Unit (AREU)
Table 3B: Import of Onions - Volume & Amount

<table>
<thead>
<tr>
<th>Year</th>
<th>Volume (Tonnes)</th>
<th>Amount C &amp; F (Rs)</th>
<th>Average Cost/Tonne C &amp; F (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>4,947</td>
<td>20,965,386</td>
<td>4,238</td>
</tr>
<tr>
<td>1996</td>
<td>5,487</td>
<td>30,743,661</td>
<td>5,603</td>
</tr>
<tr>
<td>1997</td>
<td>6,202</td>
<td>50,918,420</td>
<td>8,210</td>
</tr>
<tr>
<td>1998</td>
<td>7,232</td>
<td>61,124,864</td>
<td>8,452</td>
</tr>
<tr>
<td>1999</td>
<td>9,310</td>
<td>71,202,880</td>
<td>7,648</td>
</tr>
<tr>
<td>2000</td>
<td>7,763</td>
<td>59,759,574</td>
<td>7,698</td>
</tr>
<tr>
<td>2001</td>
<td>8,476.5</td>
<td>78,672,967</td>
<td>9,280</td>
</tr>
</tbody>
</table>

Source: Agricultural Marketing Board

Table 3C: Imports of Onions from Rodrigues

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tonne</td>
<td>Value (Rs)</td>
<td>Cost/ Ton</td>
<td>Tonne</td>
<td>Value (Rs)</td>
<td>Cost/ Ton</td>
</tr>
<tr>
<td>Grade 1</td>
<td>224.8</td>
<td>2,203,040</td>
<td>9,800</td>
<td>117.6</td>
<td>1,152,480</td>
<td>9,800</td>
</tr>
<tr>
<td>Grade 2</td>
<td>65.4</td>
<td>457,800</td>
<td>7,000</td>
<td>35.2</td>
<td>24,600</td>
<td>7,000</td>
</tr>
<tr>
<td>Grade 22</td>
<td>261</td>
<td>2,166,300</td>
<td>8,300</td>
<td>3.11.2</td>
<td>2,582,960</td>
<td>8,300</td>
</tr>
<tr>
<td>Total</td>
<td>290.2</td>
<td>2,660,840</td>
<td>413.8</td>
<td>3,565,180</td>
<td>4.62.7</td>
<td>3,902,740</td>
</tr>
</tbody>
</table>

Source: Agricultural Marketing Board
<table>
<thead>
<tr>
<th>Variety</th>
<th>Quantity purchased (t)</th>
<th>Cost/ tonne (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1 (G1) (Toupie)</td>
<td>59</td>
<td>11,800</td>
</tr>
<tr>
<td>Grade 11 (G2)</td>
<td>40.6</td>
<td>7,500</td>
</tr>
<tr>
<td>G22</td>
<td>126</td>
<td>9,600</td>
</tr>
</tbody>
</table>

Source: Agricultural Marketing Board
### Table 3E: Import and Export of Tomatoes - 1995 - 2001

<table>
<thead>
<tr>
<th>Year</th>
<th>Import</th>
<th></th>
<th>Export</th>
<th></th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity (kgs)</td>
<td>G.I.F. Value (rupees)</td>
<td></td>
<td>Quantity (kgs)</td>
<td>F.O.B. Value (rupees)</td>
</tr>
<tr>
<td>1995</td>
<td>381</td>
<td>7490</td>
<td>(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>29</td>
<td>729</td>
<td>(2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>-</td>
<td>-</td>
<td></td>
<td>6015</td>
<td>72,230</td>
</tr>
<tr>
<td>2000</td>
<td>-</td>
<td>-</td>
<td></td>
<td>909</td>
<td>20,597</td>
</tr>
<tr>
<td>2002</td>
<td>-</td>
<td>-</td>
<td></td>
<td>275</td>
<td>34,720</td>
</tr>
</tbody>
</table>

*Source: Agricultural Marketing Board*

**Notes:**

1. Value per kg 19.60
2. Value per kg 94.10 - Importation for experimental purposes
3. Value per kg 12.50
4. Value per kg 22.60
5. Value per kg 126.20 (export to Reunion Island after cyclone had hit that country)

### Table 3F: Importation of Tomato Products

<table>
<thead>
<tr>
<th>Items</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>Jan-June 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole or Pieces</td>
<td>Quantity (Tonnes)</td>
<td>Value (Rs M)</td>
<td>Quantity (Tonnes)</td>
<td>Value (Rs M)</td>
</tr>
<tr>
<td>Whole or Pieces</td>
<td>822</td>
<td>15.2</td>
<td>76.5</td>
<td>14.35</td>
</tr>
<tr>
<td>Tomato Paste</td>
<td>324</td>
<td>6.1</td>
<td>22.5</td>
<td>4.6</td>
</tr>
</tbody>
</table>

*Source: Agricultural Marketing Board*
### Table 3G: Present Area under Orchards (hectares)

<table>
<thead>
<tr>
<th>Commodities</th>
<th>Small Orchards and Backyard Gardens</th>
<th>Large Orchards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
<td>38</td>
<td>370</td>
</tr>
<tr>
<td>Pineapple</td>
<td>-</td>
<td>79</td>
</tr>
<tr>
<td>Litchi</td>
<td>200</td>
<td>46</td>
</tr>
<tr>
<td>Mango</td>
<td>1050</td>
<td>45</td>
</tr>
<tr>
<td>Citrus</td>
<td>260</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td><strong>1548</strong></td>
<td><strong>569</strong></td>
</tr>
</tbody>
</table>

Source: Central Statistics Office/Agricultural Research & Extension Unit

### Table 3H: Trend in Local Fruit Production (tonnes)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
<td>7953</td>
<td>2625</td>
<td>6135</td>
<td>9437</td>
<td>8500</td>
</tr>
<tr>
<td>Pineapple</td>
<td>545</td>
<td>258</td>
<td>1355</td>
<td>4199</td>
<td>3416</td>
</tr>
<tr>
<td>Litchi</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Citrus</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>225</td>
<td>425</td>
</tr>
</tbody>
</table>

NA: figures not available

Source: Central Statistics Office
## Table 3I: Trend in Fruit Imports (tonnes)

<table>
<thead>
<tr>
<th>Commodities</th>
<th>1990</th>
<th>1995</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>2,384</td>
<td>3,493</td>
<td>5,209</td>
</tr>
<tr>
<td>Citrus</td>
<td>2,239</td>
<td>4,100</td>
<td>6,125</td>
</tr>
<tr>
<td>Grape</td>
<td>539</td>
<td>990</td>
<td>1,768</td>
</tr>
<tr>
<td>Fresh other</td>
<td>473</td>
<td>1,603</td>
<td>2,959</td>
</tr>
<tr>
<td>Dried Grape</td>
<td>181</td>
<td>130</td>
<td>210</td>
</tr>
<tr>
<td>Dried other</td>
<td>409</td>
<td>441</td>
<td>798</td>
</tr>
<tr>
<td>Preserved Fruit</td>
<td>856</td>
<td>1,490</td>
<td>2,490</td>
</tr>
<tr>
<td>Fruit and Vegetable</td>
<td>2,464</td>
<td>3,718</td>
<td>4,626</td>
</tr>
</tbody>
</table>

*Source: CSO - Digest of Statistics*
<table>
<thead>
<tr>
<th>Commodities</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
<td>5.63</td>
<td>7.17</td>
</tr>
<tr>
<td>Pineapple</td>
<td>1.18</td>
<td>2.56</td>
</tr>
<tr>
<td>Citrus</td>
<td>2.09</td>
<td>5.51</td>
</tr>
<tr>
<td>Apple</td>
<td>2.28</td>
<td>4.43</td>
</tr>
<tr>
<td>Grape</td>
<td>0.51</td>
<td>1.50</td>
</tr>
<tr>
<td>Fresh other</td>
<td>0.13</td>
<td>2.39</td>
</tr>
<tr>
<td>Dried grape</td>
<td>0.17</td>
<td>0.18</td>
</tr>
<tr>
<td>Dried other</td>
<td>0.39</td>
<td>0.68</td>
</tr>
<tr>
<td>Preserved fruit</td>
<td>0.95</td>
<td>2.35</td>
</tr>
<tr>
<td>Fruit and Vegetable juice</td>
<td>2.69</td>
<td>4.36</td>
</tr>
</tbody>
</table>

Source: CSO – Digest of Statistics
### Table 3K: Exports of Fruits (tonnes)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Avocado</td>
<td>1.9</td>
<td>3.3</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
</tr>
<tr>
<td>Bilimbi</td>
<td>0.02</td>
<td>0.02</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mango</td>
<td>12.3</td>
<td>9.0</td>
<td>16.5</td>
<td>10.9</td>
<td>25.7</td>
</tr>
<tr>
<td>Litchi</td>
<td>62.2</td>
<td>72.1</td>
<td>145.6</td>
<td>49.0</td>
<td>10.4</td>
</tr>
<tr>
<td>Pineapple</td>
<td>311.8</td>
<td>279.0</td>
<td>570.2</td>
<td>758.6</td>
<td>436.4</td>
</tr>
</tbody>
</table>

Source: Central Statistics Office

### Table 3L: Quantity of Pineapples Exported (1995 - 2001)

<table>
<thead>
<tr>
<th>Year (July - June)</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kgs</td>
</tr>
<tr>
<td>1995-1996</td>
<td>212,780</td>
</tr>
<tr>
<td>1996-1997</td>
<td>330,104</td>
</tr>
<tr>
<td>1997-1998</td>
<td>481,959</td>
</tr>
<tr>
<td>1998-1999</td>
<td>588,119</td>
</tr>
<tr>
<td>1999-2000</td>
<td>554,236</td>
</tr>
<tr>
<td>2000-2001</td>
<td>479,227</td>
</tr>
</tbody>
</table>

Source: CSO – Digest of Statistics
Table 3M: Quantity and Value of Pineapple Exported Countrywise (1999-2000)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>Quantity (kg)</td>
<td>Value (fob) (Rs)</td>
<td>Quantity (kg)</td>
<td>Value (FOB) (Rs)</td>
</tr>
<tr>
<td>Belgium</td>
<td>38,600</td>
<td>1,407,309</td>
<td>35,700</td>
<td>860,787</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2165</td>
<td>24,519</td>
<td>5,846</td>
<td>124,958</td>
</tr>
<tr>
<td>France</td>
<td>656,997</td>
<td>21,595,734</td>
<td>334,816</td>
<td>7,884,458</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>11,943</td>
<td>355,120</td>
<td>6950</td>
<td>241,000</td>
</tr>
<tr>
<td>Greece</td>
<td>1470</td>
<td>37,394</td>
<td>440</td>
<td>11,114</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>2,538</td>
<td>101,575</td>
<td>2,112</td>
<td>98,629</td>
</tr>
<tr>
<td>Italy</td>
<td>30,222</td>
<td>788,365</td>
<td>35,926</td>
<td>1,052,265</td>
</tr>
<tr>
<td>Federal Islamic Comoros</td>
<td>438</td>
<td>34,027</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Netherlands</td>
<td>13,416</td>
<td>334,038</td>
<td>8,176</td>
<td>185,668</td>
</tr>
<tr>
<td>Reunion</td>
<td>864</td>
<td>24,749</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Singapore</td>
<td>18</td>
<td>1,488</td>
<td>84</td>
<td>1,120</td>
</tr>
<tr>
<td>Germany</td>
<td>-</td>
<td>-</td>
<td>2,592</td>
<td>63,948</td>
</tr>
</tbody>
</table>
### Table 3N: Quantity of Litchis Exported (1995-2001)

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>38,673</td>
</tr>
<tr>
<td>1997</td>
<td>72,054</td>
</tr>
<tr>
<td>1998</td>
<td>145,630</td>
</tr>
<tr>
<td>1999</td>
<td>49,000</td>
</tr>
<tr>
<td>2000</td>
<td>53,000</td>
</tr>
<tr>
<td>2001</td>
<td>141,804</td>
</tr>
</tbody>
</table>

Source: Plant Pathology Division, MoA
<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity (kg)</th>
<th>Value (fob) (Rs)</th>
<th>Quantity (kg)</th>
<th>Value (fob) (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>6,420</td>
<td>628,893</td>
<td>4,100</td>
<td>235,332</td>
</tr>
<tr>
<td>Switzerland</td>
<td>16,378</td>
<td>536,502</td>
<td>1,796</td>
<td>33,416</td>
</tr>
<tr>
<td>Germany</td>
<td>2,987</td>
<td>87,682</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>France</td>
<td>51,629</td>
<td>4,373,429</td>
<td>27,309</td>
<td>1,882,591</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3,192</td>
<td>106,166</td>
<td>21,750</td>
<td>557,605</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>358</td>
<td>5,100</td>
<td>112</td>
<td>3,360</td>
</tr>
<tr>
<td>Italy</td>
<td>10,171</td>
<td>680,476</td>
<td>9,258</td>
<td>407,371</td>
</tr>
<tr>
<td>Kenya</td>
<td>20</td>
<td>1,922</td>
<td>80</td>
<td>3,000</td>
</tr>
<tr>
<td>Federal Islamic Comoros</td>
<td>150</td>
<td>17,942</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Netherlands</td>
<td>44,096</td>
<td>3,803,643</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Reunion</td>
<td>9,573</td>
<td>215,025</td>
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<td>-</td>
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<tr>
<td>Country</td>
<td>217</td>
<td>3,100</td>
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<tr>
<td>Singapore</td>
<td></td>
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</tr>
<tr>
<td>Zimbabwe</td>
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<tr>
<td><strong>Total</strong></td>
<td>145,241</td>
<td>10,462,949</td>
<td>64,461</td>
<td>3,124,355</td>
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</table>

Source: CSO - Digest of Statistics
### Table 3P: Main Anthurium Export Markets as at 1998

<table>
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<tr>
<th>Country</th>
<th>Units</th>
<th>F.O. B. Value (million Rs)</th>
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<tbody>
<tr>
<td>Japan</td>
<td>3,783,493</td>
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<tr>
<td>Italy</td>
<td>3,398,451</td>
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<td>France</td>
<td>1,205,883</td>
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<td>Taiwan</td>
<td>706,002</td>
<td>7.77</td>
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<tr>
<td>Hong Kong</td>
<td>788,774</td>
<td>0.87</td>
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<tr>
<td>South Africa</td>
<td>66,342</td>
<td>6.73</td>
</tr>
<tr>
<td>United States</td>
<td>24,328</td>
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</tr>
<tr>
<td>Germany</td>
<td>22,729</td>
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Source: Plant Pathology Division, MoA
Table 3Q: Exports of Anthurium - Monthwise from 1994 to 1998

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<tbody>
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<td>Months</td>
<td>No. of Stems</td>
<td>No. of Stems</td>
<td>No. of Stems</td>
<td>No. of Stems</td>
<td>No. of Stems</td>
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<tr>
<td>Jan</td>
<td>407,628</td>
<td>1,694,580</td>
<td>1,535,750</td>
<td>1,642,988</td>
<td>1,617,522</td>
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<tr>
<td>Feb</td>
<td>1,588,042</td>
<td>1,664,300</td>
<td>1,609,683</td>
<td>1,211,921</td>
<td>794,329</td>
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<td>Mar</td>
<td>2,239,783</td>
<td>2,102,195</td>
<td>1,069,084</td>
<td>1,302,155</td>
<td>1,065,745</td>
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<td>Apr</td>
<td>1,611,485</td>
<td>1,257,566</td>
<td>1,359,470</td>
<td>1,324,557</td>
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<tr>
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<td>983,738</td>
<td>1,335,411</td>
<td>1,178,645</td>
<td>1,267,464</td>
<td>817,786</td>
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<td>Jun</td>
<td>808,519</td>
<td>803,386</td>
<td>900,344</td>
<td>1,046,529</td>
<td>939,578</td>
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<tr>
<td>Jul</td>
<td>533,136</td>
<td>827,017</td>
<td>655,892</td>
<td>944,582</td>
<td>896,413</td>
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<tr>
<td>Aug</td>
<td>624,506</td>
<td>999,673</td>
<td>677,015</td>
<td>781,168</td>
<td>966,189</td>
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<td>772,339</td>
<td>903,324</td>
<td>762,423</td>
<td>935,383</td>
<td>918,343</td>
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<td>Oct</td>
<td>1,586,367</td>
<td>1,628,765</td>
<td>1,137,758</td>
<td>1,466,104</td>
<td>1,062,965</td>
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<tr>
<td>Nov</td>
<td>914,234</td>
<td>1,394,809</td>
<td>1,131,327</td>
<td>952,958</td>
<td>1,061,833</td>
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<td>Dec</td>
<td>1,933,778</td>
<td>1,836,841</td>
<td>2,182,212</td>
<td>1,439,632</td>
<td>1,505,447</td>
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<td>TOTAL</td>
<td>14,003,555</td>
<td>16,447,867</td>
<td>14,199,601</td>
<td>14,315,441</td>
<td>13,006,202</td>
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Source: Plant Pathology Division, MoA
# Table 3R: Import of Fresh Cut Flowers

<table>
<thead>
<tr>
<th>Item/Year</th>
<th>Quantity (Kg)</th>
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<tbody>
<tr>
<td>Fresh Cut Flower &amp; Buds *</td>
<td>283</td>
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</table>

* Consists of Alstroemeria, Chrysanthemum, Carnation, Gypsophila, Million Star, Solidago Aster, Stargazer & Orchids

*Source: Plant Pathology Division, MoA*
## Table 3S: Export of Foliage

<table>
<thead>
<tr>
<th>Year</th>
<th>FOB Value (Rs)</th>
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<td>1995</td>
<td>1,047,653</td>
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<tr>
<td>1996</td>
<td>2,080,033</td>
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<tr>
<td>1997</td>
<td>2,943,023</td>
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<tr>
<td>1998</td>
<td>4,408,315</td>
</tr>
<tr>
<td>1999</td>
<td>6,180,205</td>
</tr>
<tr>
<td>2000</td>
<td>5,246,959</td>
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<tr>
<td>2001</td>
<td>6,002,438</td>
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Source: APEXHOM
Table 4A: Seed Production by the Ministry of Agriculture over the last five years

<table>
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<tr>
<th>Crop</th>
<th>Quantity (Kg)</th>
<th>Plantable Area (ha)</th>
<th>Quantity (Kg)</th>
<th>Plantable Area (ha)</th>
<th>Quantity (Kg)</th>
<th>Plantable Area (ha)</th>
<th>Quantity (Kg)</th>
<th>Plantable Area (ha)</th>
<th>Quantity (Kg)</th>
<th>Plantable Area (ha)</th>
</tr>
</thead>
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<tr>
<td>Amaranths</td>
<td>0.00</td>
<td>0.00</td>
<td>830.00</td>
<td>345.83</td>
<td>0.00</td>
<td>0.00</td>
<td>1291.60</td>
<td>538.17</td>
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<td></td>
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<tr>
<td>Asparagus bean</td>
<td>976.11</td>
<td>195.20</td>
<td>655.10</td>
<td>109.18</td>
<td>903.70</td>
<td>129.10</td>
<td>680.10</td>
<td>97.16</td>
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<tr>
<td>Beetroot</td>
<td>8.44</td>
<td>2.00</td>
<td>21.80</td>
<td>5.07</td>
<td>45.40</td>
<td>40.56</td>
<td>30.50</td>
<td>7.09</td>
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<tr>
<td>Bittergourd</td>
<td>220.71</td>
<td>123.90</td>
<td>41.85</td>
<td>23.50</td>
<td>83.15</td>
<td>109.18</td>
<td>270.10</td>
<td>151.74</td>
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<td>Bottlegourd</td>
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<td>130.90</td>
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<td>0.00</td>
<td>293.50</td>
<td>163.06</td>
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<td>Broad bean</td>
<td>237.90</td>
<td>4.80</td>
<td>71.90</td>
<td>1.44</td>
<td>46.20</td>
<td>0.92</td>
<td>534.00</td>
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<td>0.00</td>
<td>1.00</td>
<td>6.90</td>
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<tr>
<td>Bush lima bean</td>
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<td>0.00</td>
<td>0.00</td>
<td>66.20</td>
<td>1.32</td>
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<tr>
<td>Cabbage</td>
<td>7.40</td>
<td>61.70</td>
<td>31.40</td>
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<td>1515.83</td>
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<td>0.00</td>
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<td>9.90</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Cauliflower</td>
<td>72.80</td>
<td>502.00</td>
<td>3.35</td>
<td>23.10</td>
<td>14.50</td>
<td>100.00</td>
<td>252.20</td>
<td>1739.31</td>
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<tr>
<td>Celery cabbage</td>
<td>10.05</td>
<td>83.70</td>
<td>57.40</td>
<td>395.86</td>
<td>0.20</td>
<td>1.66</td>
<td>25.90</td>
<td>62.41</td>
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<td>Chillies</td>
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<td>117.70</td>
<td>283.61</td>
<td>26.70</td>
<td>64.33</td>
<td>0.10</td>
<td>0.24</td>
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<tr>
<td>Chinese radish</td>
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<td>11.21</td>
<td>94.30</td>
<td>88.13</td>
<td>34.25</td>
<td>14.27</td>
<td>66.40</td>
<td>18.97</td>
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<td>Chinese white cabbage</td>
<td>185.40</td>
<td>77.24</td>
<td>1540.15</td>
<td>641.70</td>
<td>451.60</td>
<td>188.17</td>
<td>465.70</td>
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<td>616.40</td>
<td>176.10</td>
<td>164.80</td>
<td>47.09</td>
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<td>79.60</td>
<td>105.35</td>
<td>110.89</td>
<td>75.04</td>
<td>78.98</td>
<td>299.25</td>
<td>315.00</td>
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<td>438.33</td>
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<td>355.00</td>
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<td>0.00</td>
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<td>5.33</td>
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<td>1995 Quantity (Kg)</td>
<td>Plantable Area (ha)</td>
<td>1996 Quantity (Kg)</td>
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<td>1997 Quantity (Kg)</td>
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<td>--------------------</td>
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<tr>
<td>Maize</td>
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<td>0.00</td>
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<td>25.46</td>
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<td>314.58</td>
<td>321.20</td>
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<td>0.00</td>
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<td>197.85</td>
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*Source: Agricultural Services, MoA*
Table 4B: Import of Vegetables Seeds in KG

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<td>380</td>
<td>467</td>
<td>249</td>
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<tr>
<td>Bittergourd</td>
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<td>0.05</td>
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<table>
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<th>Vegetable</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
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<td>Cabbage</td>
<td>109</td>
<td>179</td>
<td>94</td>
<td>99</td>
<td>10</td>
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<td>Cabbage (red)</td>
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<td>529</td>
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<td>2.5</td>
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Source: Plant Pathology Division, MoA
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Source: Agricultural Services, MoA
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Source: Agricultural services, MoA
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<td>Sideroxylon butoniana</td>
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<td>Psaola oataractae</td>
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<td>Chionanthus ayresi</td>
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30. Gaertnera pendula
31. Begonia salaziensis
32. Agalaea lamarckii
33. Badula crassa
34. Chassalia grandiflora
35. Hyphosphate vaughannii
36. Didyosperma album conjugatum
37. Zornia vaughanni
38. Psidiaca canescens
39. Chassalia carnica var johnstonii
40. Cylindrodine commersonii
41. Badula platyhylla
42. Claoxylon linostachys var branchyphyllum
43. Octea obtusa

b. Endangered Orchids
44. Angraecum adetti
45. Angraecum heureum
46. Beclardia macrostachya
47. Goodyera nudu
48. Liparis falavescens
49. Liparis purpureascens
50. Oeceoclades monophyllum
51. Phaius longibracteatus
52. Phaius pulchellus
53. Phaius villosus
54. Polystachya nr. Cultiformis
55. Polystachya nr. Humbertii
56. Selenangis asphylla
57. Bulbophyllum longiflorum
58. Angraecum liliodorum
### Table 5B: Classification of Forest Land of Mauritius (1999)

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<th>Area (H.a.)</th>
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<td>(b) National Parks</td>
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<tr>
<td>(i) On mainland</td>
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<td>799</td>
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<td>(ii) Islets</td>
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| II. Pas Geometriques  |             |                   |
| (a) Plantations       | 224         |                   |
| (b) Leased for grazing and tree planting | 230 | |
| © Unproductive (rocky) | 198         | 652               |
|                       |             | **22,492**        |

| III. Privately owned Forest Lands |             |                   |
| (a) Reserves protected by law     |             |                   |
| (i) Mountain Reserves            | 3,800       |                   |
| (ii) River Reserves              | 2,740       |                   |
| (iii) Nature Reserves            | 13          | 6,553             |
| (b) Forest Lands including scrub and grazing lands – (estimate) | | **27,987** |
| Total                             |             | **34,540**        |
| Grand Total                       |             | **57,032**        |

Source: Forestry Service, MoA
Table 5C: Trend in imports of Livestock Products (tonnes)

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Source: CSO – Digest of Statistics
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<th>Rate/ Tonne (Rs)</th>
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</tr>
<tr>
<td>Rabbit Feed</td>
<td>39.0</td>
<td>5,000</td>
</tr>
</tbody>
</table>

**Source**: MoA
### Table 5E: Goat Population

<table>
<thead>
<tr>
<th>Year</th>
<th>Herd</th>
<th>No of Goat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>16,329</td>
<td>72,696</td>
</tr>
<tr>
<td>1999</td>
<td>2,200</td>
<td>14,000</td>
</tr>
</tbody>
</table>

Source: Agricultural Research & Extension Unit

### Table 6A: Trend in Honey Production and Imports (tonnes)

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated Production (Tonnes)</th>
<th>Imports (Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mauritius Rodrigues</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>40 22</td>
<td>65</td>
</tr>
<tr>
<td>1997</td>
<td>50 19</td>
<td>94</td>
</tr>
<tr>
<td>1998</td>
<td>20 30</td>
<td>107</td>
</tr>
<tr>
<td>1999</td>
<td>10 28</td>
<td>56</td>
</tr>
<tr>
<td>2000</td>
<td>35 47</td>
<td>103</td>
</tr>
</tbody>
</table>

Source: CSO/ MoA

### Table 6B: Acreage under Agricultural Production in Rodrigues

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area under cultivation in 1992 (hectares)</th>
<th>Area under cultivation in 2000 (hectares)</th>
<th>% Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>600</td>
<td>300</td>
<td>50%</td>
</tr>
<tr>
<td>Onion</td>
<td>75</td>
<td>42</td>
<td>44%</td>
</tr>
<tr>
<td>Potato</td>
<td>112</td>
<td>10</td>
<td>88%</td>
</tr>
<tr>
<td>Garlic</td>
<td>63</td>
<td>5</td>
<td>79%</td>
</tr>
<tr>
<td>Peanut</td>
<td>30</td>
<td>20</td>
<td>33.3%</td>
</tr>
</tbody>
</table>

Source: CSO – Digest of Statistics
Table 6C: Area (hectares) harvested under Foodcrops in Rodrigues (1996-2001)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>314</td>
<td>291</td>
<td>196</td>
<td>301</td>
<td>327</td>
<td>195</td>
</tr>
<tr>
<td>Onion</td>
<td>55</td>
<td>44</td>
<td>45</td>
<td>39</td>
<td>42</td>
<td>39</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>14</td>
<td>11</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Cassava</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Beans</td>
<td>43</td>
<td>50</td>
<td>31</td>
<td>24</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Groundnut</td>
<td>19</td>
<td>12</td>
<td>12</td>
<td>18</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Garlic</td>
<td>58</td>
<td>44</td>
<td>24</td>
<td>13</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Potato</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Banana</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>51</td>
<td>21</td>
<td>27</td>
</tr>
<tr>
<td>Other food crops</td>
<td>67</td>
<td>47</td>
<td>46</td>
<td>50</td>
<td>59</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>573</td>
<td>503</td>
<td>367</td>
<td>514</td>
<td>512</td>
<td>350</td>
</tr>
</tbody>
</table>

Source: CSO – Digest of Statistics

Table 6D: Combined Livestock Export to Mauritius from Rodrigues- (1996-2000)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>1944</td>
<td>1291</td>
<td>1552</td>
<td>1594</td>
<td>2092</td>
</tr>
<tr>
<td>Sheep</td>
<td>916</td>
<td>1211</td>
<td>1196</td>
<td>1253</td>
<td>1127</td>
</tr>
<tr>
<td>Goat</td>
<td>951</td>
<td>1195</td>
<td>1440</td>
<td>1841</td>
<td>1788</td>
</tr>
<tr>
<td>Pig</td>
<td>2418</td>
<td>2422</td>
<td>2137</td>
<td>2064</td>
<td>1680</td>
</tr>
<tr>
<td>Total</td>
<td>6229</td>
<td>6119</td>
<td>6325</td>
<td>6752</td>
<td>6687</td>
</tr>
</tbody>
</table>

Source: H.P.C
### Table 6E: Agricultural Exports from Rodrigues to Mauritius

<table>
<thead>
<tr>
<th>Product</th>
<th>Volume in 1990 (tonnes)</th>
<th>Volume in 2000 (tonnes)</th>
<th>% Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pork</td>
<td>2000</td>
<td>8</td>
<td>99.6%</td>
</tr>
<tr>
<td>Fish</td>
<td>1250</td>
<td>100</td>
<td>92.0%</td>
</tr>
<tr>
<td>Oyster</td>
<td>474</td>
<td>188</td>
<td>60.3%</td>
</tr>
<tr>
<td>Chilli</td>
<td>7000 Kg</td>
<td>800Kg</td>
<td>88.6%</td>
</tr>
</tbody>
</table>

Source: CSO

### Table 6F: Quantity of Onion & Garlic Purchased by AMB from Rodrigues

<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity Purchased (Tonnes)</th>
<th>Year 1997</th>
<th>Year 1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onion GI</td>
<td>93</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>Onion GII</td>
<td>59</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Onion Veronique</td>
<td>311</td>
<td>330</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL ONION</strong></td>
<td><strong>463</strong></td>
<td><strong>368</strong></td>
<td></td>
</tr>
<tr>
<td>Garlic GI</td>
<td>35</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Garlic GII</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL GARLIC</strong></td>
<td><strong>45</strong></td>
<td><strong>2</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Agricultural Marketing Board