



## **Investigating the Sustainability of Jamaican Small Traditional Farmers in Relation to the Impact of Economic Globalization**

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### **Abstract**

This paper has summarised and has taken forward the debates around the importance off as well as how to achieve sustainability in the Jamaica Small Traditional Farming Sub-sector. Small traditional farming has played a major role in Jamaica's development and poverty reduction in the past. However, changing global conditions are widely acknowledged as factors negatively impacting its sustainability. This explorative study utilized survey methodology to gather data from twenty directors and twenty researchers employed to institutions such as Scientific Research Council of Jamaica, one hundred and forty-six (146) farmers, extension and assistant extension officers from RADA. The study was explored in terms of six proposed sustainability indicators as demonstrated by the Mandel Model for sustainable rural poultry farming.

The hypotheses were supported by the available data and are accepted at  $\alpha=0.05$ . The study therefore postulates that, the revitalization and sustainability of the small traditional farming sub-sector is critical. Small traditional farmers of Jamaica like those in Israel and Japan can become efficient and achieve global competitiveness by means of an increase in endogenous innovations, along with improvements in the operational and administrative functions of agrarian institutions. These rural communities are likely to experience increased economic activities and development, hence better standard of living. There is the need for citizens in rural Jamaica to achieve cultural and educational changes. More than 40,000 Jamaican families can improve their standard of living directly and a further 30,000 families can experience indirect benefits.

**Keywords:** Rural Community Development; endogenous innovation; and sustainability

## **1. Introduction**

This research focused on the traditional small farmers of Jamaica who grow the following agricultural crops: sugar, bananas, coffee, citrus, pimento, cocoa and coconut on two to ten acres of land. World Bank (2010) stated that on an average seventy per cent of the world poor live in the rural areas and agriculture is their source of income and employment [1]. Jamaican Farmers have consistently maintained the position of being Jamaica's economic backbone for many decades (RJR, 2003) [2]. The activities of this group of individuals, which number over one hundred thousand, have been the foundation of this nation's productive economy. This group of predominantly small farmers has contributed to the welfare of two and a half million Jamaican citizens; as consumers of food (Levitt, 2000) [3].

### **1.1 The Problem**

The mainstream economists, for more than a century have enthusiastically and confidently predicted the demise of the small farm. Small farms have been viewed as an obstacle to be overcome in the process of economic development. They have been labelled as unproductive, inefficient and backward. The American model of large scale, mechanized, corporate agriculture is held out as the best, if not the only way to feed the world's population. Small or peasant farmers have been expected to go the way of the dinosaurs.

From the plethora of literature reviewed, it is clear that throughout the many decades, Jamaica's Small Farmers have suffered from a changing international environment, variable public policy and severe objective constraints. These challenges gave rise to reduction in the sub-sector's contributions to Gross Domestic Product (GDP), which remained constant between 1870 and 1939, but diminished sharply thereafter and by 2004 it had fallen to less than three per cent (3%) of GDP. The on-going process of trade liberalization has now taken a step further in the World Trade Organization (WTO) negotiations for the Agreement on Agriculture (AOA). The Agreement on Agriculture has the potential to severely undercut the remaining viability of small farm production, with potentially devastating consequences for rural economies and environments worldwide [4]. This paper postulates that:

- a. the additional challenges resulting from the advent of economic globalization have increasingly cemented in the minds of many of the stakeholders in the agricultural sector, the theory that the periods of small farming (peasant farming) are over. The achievement of increased outputs can only be attained with a change towards larger and more intensive farming practices. Unfortunately, such changes are likely to run counter to rural communities' development, since many if not all small traditional farmers will be marginalized due to their inability to garner investment funds for expansionary purposes.
- b. the problems of the Jamaican Small Farmers were not properly explored, since the solution employed, or lack thereof, only served to make them more of an endangered species. It can be argued that the solutions, including technological changes, were geared more for large scale agricultural practices. Additionally, many of the operations of Jamaican Agrarian Institutions are not in the interest of the small farmers and often times are more of an obstacle to them [4].

### **1.2 Importance of Study**

This research explains the responsibility of the Jamaican Agrarian Institutions and the absence of endogenous innovations in the decline of the sub-sector. Strategic alliance with the Jamaica Tourism Sector and other productive sectors is the development model which enables the diversification of agriculture and target the utilization of endogenous approaches in an effective manner to distribute benefits for the majority of the community [5]. Significant improvement in

infrastructural development within the island, market knowledge and accessibility, training of rural citizens, quality control of the services, availability of low cost financial assistances and the location of agrarian activities in light of the fact that Jamaica has such a diverse weather pattern as well as an abundance of underground water supply are foundation for the sustainability of small traditional farmers in Jamaica.

### **1.3 Significance of the Study in Academic Literature**

The results obtained can be extrapolated to agricultural sectors in other economies around the world. It adds to the volume of literature relating to the utilization of popular hybrid farming practices that retained the quality of high growth with high quality agricultural products. It adds to the literature generated from research done on mixed systems (agriculture-livestock) in the Meditarrean Basin, and mixed rice-fish systems in Asia. [6 & 7] In addition, the study helps stakeholders to understand the effects brought about due to the lack of technological adoption by the small farmers. The study demonstrates that regardless of the size of the farm, there is room for technological improvement.

## **2. Materials and Method**

### **2.1. Activities of the Small Traditional Farmers**

The traditional small farmers of Jamaica grow agricultural crops such as: sugar, bananas, coffee, citrus, pimento, cocoa and coconut. The activities of this group of individuals, which number close to sixty thousand, have been the foundation of this nation's productive economy. This group has contributed to the welfare of two and a half million Jamaican citizens; as consumers of food. [3] [8] Planning Institute of Jamaica demonstrated that the small farmers are a major participant in:

- a. the earnings and savings of foreign exchange. The highest earnings took place in 2004 and 2006 of US fifty-six thousand six hundred and twenty-eight dollars (\$US 56,628) and US forty-six thousand four hundred and fifty-nine dollars (\$US 46,459) respectively.
- b. the creation of employment for citizens mainly in the rural communities. The sub- sector provides direct employment to approximately eight per cent (8.15%) of the labour force which amounts to approximately sixty thousand (60,000) persons. It also supports approximately one hundred and seventy-four thousand (173,956) families and contributes to the island's food security. These small farmers also assisted in creating thousands of indirect employments in areas such as tourism and manufacturing. [9]
- c. the island's gross domestic product (GDP). It is responsible for less than four (4) per cent of Jamaica's GDP. [10]

### **2.2. Economic Globalization**

According to Pyle, Economic globalization involves a wide variety of processes, opportunities, and problems related to the spread of economic activities among countries around the world. It started in the latter part of the nineteenth century to the present. Since the 1970s capitalism has spread throughout more of the world and as a result there has been an increased reliance on markets versus government involvement in the economy by most nations (including industrialized countries, developing countries, and formerly socialist countries like China with over one-fifth of the world's population). [11]

A large number of developing countries have also shifted to the more open export-oriented approach based on production for external trade from an import substitution development strategy. Multinational Corporations (MNCs) in service, manufacturing, and finance sectors

have moved into new tiers of countries and have established burgeoning networks of subcontractors in many areas. Since the advent of the late 1970s, economic globalization has also involved structural adjustment policies (SAPs), mandated by the International Monetary Fund (IMF) as a condition for granting countries loans. SAPs require governments to take many steps that further promote globalization.

Importantly, there have been a significant shift in the power of key international institutions. The influence of many national governments has been eroded by the rising importance of institutions like the MNCs, the IMF, and World Bank (WB), and trade organizations such as the World Trade Organization (WTO). On the other hand, there has been an increase in nongovernmental organizations (NGOs) advocating for the rights of groups of citizens. Economic globalization since its advent has resulted in an increase in the international movements of goods and services, capital (portfolio investments or foreign direct investment by MNCs), and labour as people migrate for employment. This stage of economic globalization is driven by changes in technology (telecommunications and information technology) and transportation and is accompanied by trade and investment policies liberalization and for many developing countries the removal of preferential agreements. [12] However, economic globalization has occurred in a very uneven manner. Countries are integrated into the global economy to very different degrees. This has resulted in rising inequality and tension, which are increasingly considered to be the demerit of both the increased reliance on market forces and the changes in the international power structure.

### **2.3 Support for Small Traditional Farming**

Small farms are preferred to large since they are better able to increase equity and reduce poverty. They are normally operated by poor people who use much of the labour, both from their own households and often times their poor neighbours. Small farmers incurred very little debt against their assets, hence, a low debt to equity ratio. Small farm households have favourable expenditure patterns for promoting growth of local non-farming communities including rural towns. They spend a higher per cent of their incremental incomes on rural non-tradable goods when compared to large farm households. The spending incurred by the small farm households stimulated additional demand for the many labour intensive goods and services that are produced in local villages and towns. These demand growth linkages provide greater income earning opportunities for small farms and landless workers among others. [13]

#### **Case Study 1: European Union drive for small organic farming**

Since 2000 the demand for organic products has increased substantially. The European Union has taken the lead in sponsoring programs designed to increase the cultivation and marketing of traditional crops. Organic farming is at the heart of a seven-point plan announced by the European Commission to tackle the continent's BSE (mad cow disease) crisis. The Commission called for a move away from industrial farming and increased support for extensive, organic agriculture.

"The BSE crisis demonstrated the need for a return to farming methods that are more in tune with the environment." He also made clear in his proposal that "the United Kingdom's (UK) Soil Association estimates that demand in the UK for organic food is growing by more than forty per cent (40%) a year and much of Europe is following the same trend." [14]

#### **Case Study 2: Productivity of small farms in Asia and Latin America**

In Thailand, farms of two to four acres produce sixty per cent (60%) more rice per acre than bigger farms. In Taiwan net income per acre of farms of less than 1.25 acres is nearly double that of farms over five acres. In Latin America, small farms are three (3) to fourteen (14) times more

productive per acre than the large farms. Across the Third World, small farms are two to ten (2-10) times more productive per acre than larger farms and in the US, farms smaller than twenty-seven (27) acres have more than 10 times the dollar-per-acre output of larger farms. In Britain a recent study of the hidden costs of industrial farming raised the bill to £2.3 billion -- almost as much as the farm industry's total income.

In the United States of America, small farms have three times as many trees per acre as larger farms. They have more biodiversity and do less environmental damage and since they're diversified, they're not tied to the vagaries of a single-product market. "Small family and part-time farms are at least as efficient as larger commercial operations. There is evidence of a positive correlation between diseconomies of scale and farm size." [15]

### **Case study 3: Demonstrating the success of Israel and Japan Small Farming Sub-Sectors**

Israel's Agricultural miracle actually started in areas where rivers and streams do exist and as such crops were better irrigated which precipitated the constant increased in outputs as was experienced in the fifties and thereafter. Success was also a result of the flexibility of development strategies employed by the sub-sector. Since the beginning of the 21<sup>st</sup> Century there has been cause for concern about the state of agriculture in Japan. The maintenance of fertile land has been neglected, and the long-term sustainability of farmland has deteriorated due to excessive dependence on chemical fertilizers and agrochemicals.

Full-scale sustainable agriculture in harmony with the natural environment cannot function under these conditions. In order to improve conditions in the sector, lawmakers in Japan passed three environmental agricultural laws. These laws were designed to strengthen coordination between crop farming and raising livestock, so animal manure is effectively composted, and crop soils are revitalized with organic fertilizer. These changes are required in order to maintain, improve and increase the use of the natural cyclical nature of agriculture, meaning a return to the traditional style of agriculture. [16]

## **2.4 Methodology**

The data gathered by means of the Electronic mailing system and face to face interview (include an elite group of twenty directors and senior directors from agricultural agencies, Ministry of Tourism and Jamaica Trade and Investment, twenty researchers employed to institutions such as Scientific Research Council of Jamaica, Sugar Industry Research Institute (SIRI), Bodles Agricultural Research Station, Caribbean Agricultural and Research and Development Institute (CARDI) and 146 small farmer and Rural Agricultural Development Agency Extension Officers from the five major agricultural parishes. The data was collected with the aid of three semi-structured instruments after which the analysis was done using parameter estimate and regression analysis techniques. Mandal Model for Sustainable Rural Poultry Farming was then used to affirm the following null hypotheses:  $H_0: \mu_1 =$  Strategic alliances between the small traditional agricultural sub-sector and local productive sectors result in increased outputs and earning capabilities of small farmers.  $H_1: \mu_1 =$  Strategic alliances between the small traditional agricultural sub-sector and local productive sectors result in decreased outputs and earning capabilities of small farmers.  $H_0: \mu_1 =$  Endogenous innovation within the Jamaican Agrarian Sector results in increased sustainability of the Jamaican Small Traditional Farming Sub-sector.  $H_1: \mu_1 =$  Endogenous innovation within the Jamaican Agrarian Sector results in decreased sustainability of the Jamaican Small Traditional Farming Sub-sector (See graph 1, Appendix 1). [17] The results of this research were presented to the relevant stakeholders by means of presentations at relevant seminars. Although the research has achieved its aims, there are some

unavoidable limitations. First, this research was conducted only in five of the fourteen parishes. However, these are the island's major agricultural parishes. A longer time period is more appropriate for a research of this nature.

### **3. Results**

Results emanating from this study demonstrate that small traditional farming does have a future in rural Jamaica. This can be done; through increased productivity, more efficiency in the usage of scarce resources, especially land, water and human capital, reduction in waste and environmental damage that often time spill over into other sectors. Ultimately this will result in economic growth and poverty reduction in the farming communities and by extension the other sectors of the economy. Despite the fact that changing global conditions since the 1980s have made development and poverty reduction much more difficult to be achieved. This research with the aid of M.K Mandel Model for Sustainable Rural Poultry Farming has demonstrated that the sub-sector can be achieved economic efficiency, environmental quality and social responsibility, which are the three goals of sustainable agriculture. [17] These three goals can be achieved, if the following important methods and procedures are employed:

- a. Favorable contractual agreement between traditional farmers and the productive sectors (agri-business, tourism, retailing and manufacturing) would increase production of traditional crops. This agreement is likely to be cemented, if it is established by parliamentary legislations and managed by officers of the Rural Agricultural Development Agency or Jamaica Agricultural Society or both. The agreement should take the form of backward and forward integrations and undoubtedly must; be able to take advantage of trade liberalization, be cost effective and profitable for the parties involved. The products must be produced without any environmental destruction. The above favorable contractual agreement is affirmed by an average of ninety-one per cent of the respondents, which results in a Z-Value confirmation of 5.351. 5.351 is significantly greater than the 95% or approximately 1.96 confidence level that has been established for this research (See appendix table 1 and figure1).
- b. Reduction of both short term costs or input costs and long term or environmental clean-up costs due to the accumulation of nitric acid in the soil and water is central to the success of the sub-sector. The employment of locally produced manure and intercropping with legumes are methods that would reduce input costs such as costs of fertilizers, pesticides and herbicides. The usage of these inputs often resulted in negative externalities, which are often times very costly. Intercropping also makes possible more rapid cash inflows to the small farmers and their families. Another cost cutting measure involves the Jamaica Agricultural Society (JAS) being enlisted on the Jamaica Stock Exchange and the funds obtained is use to provide loans with competitive interest rates combined with a moratorium of at least one year to the small farmers. No less than thirty per cent (30%) of these shares are to be owned by the Jamaican Small Farmers. Ownership of these shares acts as productivity improvement stimulus for the small farmers. The methods by which the above input costs to the small farmers can be reduced is affirmed by an average of eighty-three per cent of the respondents. (see appendix, table 2)
- c. The third method is the introduction of clear and precise government policies and programs designed with significant inputs from representatives of the small traditional farming subsector. The results include:
  - The establishment of insurance coverage for the small farmers, with the understanding that payments for damages caused by natural disasters will be made within two weeks after such occurrence. However, small farmers have to sign on to the program and ensure that their

premiums are made on a timely basis.

- Increase number of research activities that will result in traditional plants having shorter maturity period and greater resistant to natural disasters and diseases. The provision of short training courses at the island tertiary institutions. These courses must be geared towards the increased utilization of the island's scarce resources in the most efficient manner. Training should be centred on the areas of; farm management, proper accounting, crop care, post harvesting of crops and how to access market information using technology, such as the cell phones. Family members should also be trained in the art of how to make by-products from traditional products as well as revenue methods by means of agro-tourism and how to consistently produce and use organic manure. Leadership and team building techniques must also be part of the curriculum so that small farmers can develop and implement initiatives to enhance the sub-sector. Team building will also enable the small farmers to be more trustful of each other and hence are more incline to collaborate on activities. Success is positively correlated to the number of small farmers who participated and utilized the knowledge garnered from the program of studies.
- Increase cultivation of crops in areas where there are water tables and or high levels of condensation. This will reduce the reliance on rain fall. Culture changes in the agrarian institutions are required to be shifted in the direction of the small farmers. They need to feel and rightly so, that they are extremely important in the economic development of the Jamaican Economy.

The elimination of institutional biases towards the small traditional farmers will enable the sub-sector and other related sectors to grow substantially. The Jamaican Government should institute policies that will ensure that grants and or low interest rate loans are easily available to the small farmers and also provide to them the necessary assurance that their property will never be confiscated but that at all times a payment plan will be tailored in order to cushion any form of economic hardship. The above third method is affirmed by an average of eighty-three per cent of the respondents (see appendix, table 3)

The reduction of both short term and long term costs together with clear and precise government policies and programs that are designed with significant inputs from representatives of the small traditional farming subsector are confirmed by a Z-Value of 2.007. This is greater than the 95%  $\approx$  1.96 confidence level established for this research (See appendix, figure 2, tables 2 & 3).

#### **4. Discussion**

In general, central government is the most important authority in establishing and implementing development policies. It is also extremely critical for policy makers in the Ministries of Agriculture and related agencies to incorporate the ideas and requests of representatives of the small farming subsector in decision-making and implementation of the respective policies and programs.[18] Small farmers for many years have consistently requested of their political leaders parliamentary legislations and regulations which no doubt are critical ingredient in the; operations of the small traditional farmers, establishment of contractual agreements among government, productive sectors, and small farmers. The Jamaican Government must be the driving force in the move towards small-scale, environmentally friendly organic farming. Legislations resulting in the availability of grants and low interest rates loans from various credit unions must be designed by the government so as to encourage farming practices that are environmentally friendly. Small farmers are motivated to produce organic manure consistently and ultimately increased agricultural products once leadership is obtained from those who have power and the availability of resources. This is in line with the

activities undertaken by both Israel and Japan, which ultimately enabled these two developed countries to achieve their agricultural miracle. [16]

Manufacturing organic manure locally provides opportunities for increased employment and purchasing power among the rural citizens. Jamaica Agricultural Society (JAS), Rural Agricultural Development Agency (RADA) Officers and hospitality institutions respectively must also be responsible for:

- a. providing training to the local citizens in the production of organic manure
- b. providing training to the small farmers in the cultivation of organic products. This include the quantity of manure to be used and when the plants are to be fertilized.
- c. providing training to the local citizens on how to manage their operations as a small business. This no doubt will help the business to be sustainable. JAS and RADA Officers may require to source the necessary resources from tertiary institutions in the various parishes. Tertiary institutions should be commissioned to provide training to local citizens in their respective parishes. The College of Agriculture Science & Education (CASE) to provide training to citizens in the parishes of Portland and St. Mary. Northern Caribbean University {NCU} and University College of the Caribbean provide training to citizens in the parishes of Manchester and St. Elizabeth. However, the success of this procedure depends to a large extent on the willingnes of members of the small farming subsector to access and utilized the facilities offered.
- d. coordinating the sales of traditional products to other sectors in the alliance. The Centre for International Agricultural Development Cooperation (CINADCO), (Israel's professional Agricultural Body) was instrumental in the country's fifty seven years of agricultural progress. European Union since 2000 has been the catalyst behind the growth of small organic farming in the European Continent.[14] The above findings demonstrate that small farming activities provided a variety of benefits. This is confirmed in the report title Multiple function and benefits of small farm agriculture [19]

The entity should issue common stocks to the public and the proceeds from the sale of its shares is used to provide low interest rate loans to the small farming sub-sector for the purpose of achieving sustainability in its activities. Success in this venture requires small farmers to own no less than thirty per cent (30%) of the issued shares.

Small traditional farmers' reliance on rainfall for irrigation purposes can be reduced as long as agrarian activities are concentrated in areas where the night time temperature is low, hence more condensation for irrigation the following day as well as areas where there are water tables. These two characteristics make it possible for the plants to be properly irrigated without relying on heavy rainfall.

Ritchie and Crouch reported that the following government policies are important for the sub-sector. Infrastructure policy (can make destination safer and attractive for the visitors), Local zoning policy/by-laws can restrict or encourage tourism facility development, Land use and land assignation, Water resource management, Heritage conservation, Credit facility (granting reduced-interest loans to business and enterprises affects costs and therefore profitability), Tax and subsidies (Tax concessions for investments, can affect the growth of the industry negatively and positively and finally for the profitability of the destination), Minimum wage policy (can affect labour markets), Agricultural policy (Organic farming, Soil conservation), Welfare policy (can influence the nature and behaviour of the work force), Education, extension and Training policy (can affect the quality of the workforce), Marketing policy, Environmental policy (Limits growth and access to attractive but sensitive areas). [20]



## 5. Conclusion and Suggestions

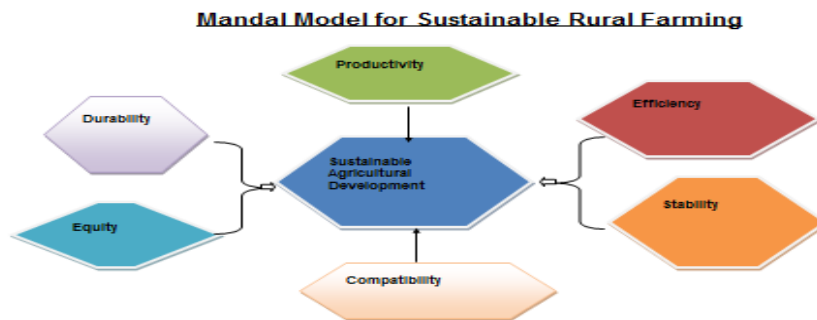
Are the mainstream economists correct in their prediction that, small traditional farmers or peasant farming is an endangered species and therefore, will go the way of the dinosaur? Are small farms unproductive, inefficient, and backward and therefore, an obstacle to be overcome in the process of economic development? Is the American Model of large scale, mechanized, corporate agriculture the best way to feed the Jamaica's Population? Does the Jamaica small farming Sub-Sector have a sustainable future with the advent of economic globalization?

This dissertation has investigated the importance of small farms and specifically small traditional farming and how it can be revived and become sustainable in this new dispensation. It has demonstrated that, despite the many challenges faced by the sub-sector, especially over the last twenty-five years, its revitalization and sustainability is not only attainable but is also critical. This sub-sector experienced mixed blessing throughout its existence. For several decades it was the main economic contributor to the island's rural economy. Increased employments and farm incomes, a reduction in food prices as well as the establishment of strong growth linkages with the non-farming economy such as agro-business, tourism, retailing and the manufacturing sectors, should be the results of economic activities of the island's small traditional farmers. However, small traditional farmers are equally responsible for the success of this subsector. They are required to play their roles such as participating and utilizing knowledge garnered from the training provided. It is the view of the researcher that further experimental investigations are to be done so that traditional plants having greater resistance to diseases and shorter maturity periods can be engineered.

## Appendix

### Graph 1: Mandal Model for Sustainable Rural Farming

Figure adopted from Mandal Framework



Source: (Mandal M K, N. Khandekar , D.P. Singh and P. Khandekar , 2005)

**Table 1:** Strategic alliances between the small traditional agricultural sub-sector and local productive sectors result in increased outputs and earning capabilities of small farmers.

	<u>% positive response</u>	% negative response
Researchers & lecturers	96.0	4.0
Farmers & RADA Officers	87.5	12.5
Elite & focus groups	90.6	9.4
Average	91.37	8.63

**Figure 1:** Strategic alliances between the small traditional agricultural sub-sector and local productive sectors result in increased outputs and earning capabilities of small farmers.

Category	Number of Respondents	Percentages
Success	175	91.37%
Failure	16	8.633%
Total	191	100%

H<sub>0</sub>: p > 0.75     α/2 = 0.05/2 = 0.025     C.R = Z<sub>α/2</sub> = Z<sub>0.025</sub> = Z > 1.96

$$\text{Using } z = \frac{x - np}{\sqrt{npq}} = \frac{175 - (191)(0.75)}{\sqrt{(191)(0.75)(0.25)}} = \frac{175 - 143}{\sqrt{35.76}} = \frac{32}{5.98} = 5.351$$

Z = 5.351 which exceed 1.96

**Table 2:** Reduction of both short term costs or input costs and long term or Environmental clean-up cost

	<u>% positive response</u>	% negative response
Researchers & lecturers	81.63	18.37
Farmers & RADA Officers	83.74	16.26
Elite & focus groups	82.8	17.2
Average	83.33	16.67

**Table 3:** government policies and programs designed with significant inputs from representatives of the small traditional farming subsector

	<u>% positive response</u>	% negative response
Researchers & lecturers	72	28
Farmers & RADA Officers	83.33	16.67
Elite & focus groups	81.7	18.3
Average	79.01	20.99

**Figure 2:** Increased sustainability of the Jamaican Small Traditional Farming Sub-sector due to endogenous innovation within the Jamaican Agrarian Sector.

Category	Number of Respondents	Percentages
Success	155	$(83.33 + 79.01)/2 = 81.17\%$
Failure	38	18.83%
Total	191	100%

H<sub>0</sub>:  $p > 0.7$        $\alpha = 0.05$       C.R. =  $Z_{\alpha/2} = Z_{0.025} = Z > 1.96$

Using  $z = \frac{x - np}{\sqrt{npq}}$  =  $\frac{155 - (191)(0.75)}{\sqrt{(191)(0.75)(0.25)}} = \frac{155 - 143}{\sqrt{35.76}} = \frac{12}{5.98} = 2.007$

Z = 2.007 which exceed 1.96

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