Demand Analysis Report- Republic of Botswana

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CONTENT

LIST OF ABBREVIATIONS

AI	*Artificial Insemination*
AIDS	*Acquired Immune Deficiency Syndrome*
BCA	*Botswana College of Agriculture*
BMC	*Botswana Meat Commission*
BOTEC	*Botswana Technology Centre*
CBPP	*Contagious Bovine Pleuro Pneumonia*
GDP	*Gross Domestic Product*
GOB	*Government of Botswana*
HIV	*Human Immune Deficiency Virus*
ICT	*Information Communication Technology*
MFDP	*Ministry of Finance and Development Planning*
MOA	*Ministry of Agriculture*
NAMPAADD	*National Master Plan for Arable Agricultural and Dairy Development*
NAMPAD	*National Master Plan for Agricultural Development*
NGO	*Non-Governmental Organizations*

Training Needs Analysis for Strengthening Extension Services in Botswana

Executive summary

The Agriculture sector of Botswana has experienced a steady decline in its contribution to GDP over past 50 years. The poor performance of the sector, therefore, represents an added challenge to the fight against poverty. This training needs analysis is carried out to identify the potential areas of capacity building in agricultural sector of Botswana which would in turn, contribute to revitalize the agricultural production of the country. Extensive literature review disclosed that skills of extension workers are low in the areas of forestry production; interpersonal communication skills; practical farm skills; organizing effective field days; mobilizing people to form groups; conducting need assessment surveys; organizing effective field trips and farm walks; crop protection and pest control; fruit production and planning; and setting up result demonstrations. Crop production also continues to experience limits on its growth posed by recurring drought, limited skills, and inadequate use of improved technology. Addressing the identified gaps is very useful for agricultural development which, in turn, contributes to poverty reduction program of the country. The National Master Plan for Agricultural Development also identified vegetable production as one of the priority areas with potential for development in Botswana. Such potentials are exploited through capacity development program of agricultural sector of the country. Generally, agriculture needs due consideration for fighting poverty particularly, in the rural areas. Likewise, the gap between production and consumption of agriculture products in the country will be narrowed. For its effect, it needs to capacitate extension workers through in-service training which is the principal intervention mechanisms for filling the training gaps that are identified.

1. An overview of Botswana

Botswana is a landlocked country in Southern Africa. It has a land area of 582,000 square kilometers. It is larger than France and about the same size as Texas. Botswana's terrain is mostly flat desert, savannah and grassland. It is bordered on the southeast and south by South Africa, on the west and northwest by Namibia, on the north by Zambia, and on the northeast and east by Zimbabwe. It got its independence in 1966 and during the period it was the second poorest country in the world next to Bangladesh. Since its independence, its economy is highly transformed and its GDP is about $18,825 per year as of 2015 which is the highest in Africa. As a result, it became an upper middle income country. A mid-sized country of just over 2 million people, Botswana is one of the most sparsely populated nations in the world. Around 10 percent of the population lives in the capital and largest city, Gaborone.

Botswana is topographically flat, with upto 70 percent of its territory being the Kalahari Desert. It is a haven for wildlife especially, hosting the largest population of elephant in the world. In the northwest of Botswana lies the Okavango River which empties into the flat Kalahari Desert to form one of the largest inland deltas in the world. This is the only area of Botswana that holds significant amounts of permanent water. There are no permanent rivers elsewhere inside Botswana, although part of the northern border of Botswana is formed by the Chobe River and, for a short distance, the Zambezi. Apart from a moderately fertile strip along the eastern side of the country, the Kalahari (Kgalagadi) Desert blankets almost the entire remaining portion of Botswana.

The citizens of Botswana refer to themselves as Batswana (singular: Motswana). Formerly the British protectorate of Bechuanaland, Botswana adopted its new name after becoming independent within the Commonwealth on 30 September 1966. Since then, it

has maintained a strong tradition of stable representative democracy, with a consistent record of uninterrupted democratic elections.

Botswana was formerly one of the poorest countries in the world with a GDP per capita of about US$70 per year in the late 1960s. The strong economic policies has since then transformed Botswana into one of the fastest-growing economies in the world, now boasting a GDP (purchasing power parity) per capita of about $18,825 per year as of 2015, and one of the best performers in African Continent. Its high gross national income (by some estimates the fourth-largest in Africa) which gives the country a modest standard of living and the highest Human Development Index of continental Sub-Saharan Africa.

Botswana is a member of the African Union, the Southern African Development Community, the Commonwealth of Nations, and the United Nations. Despite its political stability and relative socioeconomic prosperity, the country is among the hardest hit by the HIV/AIDS epidemic, with around a quarter of the population estimated to be infected. The discovery of diamonds in 1967 was the landmark for the economic development of the country. Diamonds account for an estimated 60% of government tax revenue. It is expected that diamond revenues will stagnate in 2017 and there may be need to change to underground mining to extract diamonds. The Mid-Term Review of the Tenth National Development Plan (NDP10) observes that although there is considerable evidence of diversification of the economy, the concerns remain regarding the pace of diversification and the attained growth rates. The country is ranked highly on governance and economic competitiveness indicators. Together with Mauritius, Botswana shares the distinction of having the longest working liberal democracy in Africa. Free and fair elections were being held regularly since 1965.

The 2012 Mo Ibrahim Index of African Governance, which is Africa's leading assessment of governance, indicates that Botswana is ranked 3rd (77%) after Mauritius (83%) and Cape Verde (78%). On safety and the rule of law combined, Botswana is rated 1st with an overall score of 89% whilst on the rule of law alone, Botswana is still rated 1st in Africa with an exceptionally high score of 97%. On Participation and Human Rights, which category includes gender, Botswana is ranked 4th with an overall score of 71%. It is however recognized that Botswana should continue to strengthen its capacities especially as it relates to emerging challenges, some of which are global and are cross border in nature like cyber-crimes, money laundering, as well as strengthening the

necessary legislation in order to effectively address these challenges. The state has pursued a developmental agenda with impressive results in health; education and infrastructure development. In the area of poverty reduction, the country has reduced the proportion of the population living on less than a dollar a day from 23.5% in 2003 to 6.5% in 2010. This new level of absolute poverty is much closer to that found in other middle income countries. According to most recent information, the proportion of the population living below the poverty line declined from 30.6% in 2002-2003 to 19.3% in 2009-2010, while the share of the population in extreme poverty fell even more sharply from 23.4% to 6.5%. Further reductions are possible as illustrated by the trend for Chile. Despite the decline in poverty, inequality and exclusion are still serious issues in Botswana, whose Gini coefficient is 0.61. Poverty in Botswana displays a geographical and gender dimension, with 8.4% of the rural population living in extreme poverty compared to 2.7% in urban areas and female-headed households more likely to be poor than their male-headed counterparts. This reflects the disparities in quality of economic opportunities and services and underlines the need to ensure more inclusive development policies and programmes.

A feature of Botswana that is somewhat at odds with the country's upper middle income status is the high level of unemployment. Young people and women are disproportionately represented among the unemployed. The persistently high level of unemployment suggests a need to carefully manage social support so that it does not provide disincentives for the uptake of low wage employment.

Another salient feature of Botswana is high income inequality. The skewed distribution of income leaves the population at the bottom of the income pyramid open to various challenges including: a high level of vulnerability to shocks; primary concern with survival needs to the neglect of long-term needs such as old-age financial needs; self-exclusion from participation in local governance; limited market participation; high reliance of publicly provided services; exclusion from regulated banking; and exposure to high cost informal lending that traps households in perpetual poverty.

Enhancing the participation of citizens in the economy of the country is a key priority for the Government of Botswana. The Government's strategy includes creating opportunities in the formal sector as well as opportunities for the expansion of informal activities.

2. An overview of Agricultural sector, policies, programmes and priorities

The Agricultural sector in Botswana covers both crops and livestock production. Traditional farming is the most dominant in terms of number of people involved and the geographical coverage. The majority of farmers are small-scale farmers who typically need continued assistance in capacity building to commercialize agriculture. An effective and vibrant extensive service is therefore an important input in improving the performance of the sector and its resilience to market changes and climate change. Advances in agricultural science and technology have historically played a critical role in alleviating hunger and rural poverty. The beef industry is the only sub-sector of the agriculture sector that has constantly remained a significant contributor to the national Gross Domestic Product (GDP). The Agriculture sector has experienced a steady decline in its contribution to GDP over past 50 years. The poor performance of the sector therefore represents an added challenge to the fight against poverty. From a 42.7% share in GDP at independence in 1966, agriculture has fallen to 1.9% as at 2008 (Ministry of Finance and Development Planning, 2010). According to NDP 10, only 45% of farmers have access to roads, 17% electricity, 22% telecommunication, 64% water for livestock, 66% water for domestic use, 43% water for irrigation, 39% grain storage, 52% markets and 54% sanitation (Ministry of Finance and Development Planning, 2010)**.** This has resulted in slow agro-industrial and supply chain development that is needed to drive the growth of associated sub-sectors such as food processing, transport and manufacturing. The livestock sector has fared much better over the years, compared to the crop sector. The volumes and diversity of livestock has shown increases (with minor fluctuations owing to drought and diseases), except for cattle. Poultry and piggery have shown significant increase. Productivity indicators for livestock show improvements in terms of reduced mortality rate, increased birth rates but limited change in off take. In real terms, the livestock value has been declining over the years. The specific period reported in the Livestock Accounts Report is 1980 till 2003 (Department of Environmental Affairs, 2007). Crop production has been the most vulnerable part of the agricultural sector due to its heavy reliance on rainfall. As a consequence of low and erratic rainfall, and relatively poor soils, arable production is a high risk, rain-fed system with low productivity.




About **70%** of rural household derive their livelihoods from agriculture, through subsistence farming. Crop production is mainly based on rain-fed farming. The farming is dominated by small traditional farms with an average size of five hectares. About 63,000 arable farms fit under this category, while only 112 farms are larger than 150 hectares (Statistics Botswana, 2012).

Botswana is now embarking on two main activities:

1. The National Strategy on Sustainable Development (NSSD): Through this work, Botswana charts a blue print for development of a growth pathway that is economically, socially and environmentally sustainable, contributing to human welfare by reducing poverty, while following an economic development model that facilitates protection of the environmental resource base on which that growth is dependent. So far, Botswana has identified the sectors of Water, Energy and Agriculture as instrumental to supporting this Greener growth pathway.

2. Development of a Low-Carbon Strategy or Climate Change Policy, Strategy and Action Plan: Even though Botswana ratified the UNFCCC in 1992, the Convention was never localized in terms of an official policy document to guide implementation. In 2013, this work began with the development of a Comprehensive National Policy on Climate Change, which was followed by the development of a Strategy and Action Plan which

charted a low-carbon development strategy for Botswana. There's also realization of the need to localize the Rio+20 outcomes internally within the United Nations. UNDP has therefore taken the initiative to start the internal discourse within UN Botswana by developing a draft discussion paper on localizing and internalizing Rio+20 in UN Botswana. This assisted the UN system to define the Rio+20 outcomes for itself in order to properly align its support to Botswana's efforts towards a sustainable development pathway.

In 1989 the Ministry of Agriculture was reorganized into four departments, three support divisions and five parastatal organizations (www.gov.bw). Agricultural Services Support (ASSP) project, jointly financed by the Government of Botswana and the International Fund for Agricultural Development (IFAD) has also been implementing since 2012. The goal of the ASSP is to contribute to economic diversification, reduction of rural poverty and food insecurity, and improved livelihoods of rural communities. The specific development objective is to achieve a viable and sustainable smallholder agricultural sector based on farming as a business, and not reliant on subsidies or welfare measures.

3. An over view of Horticulture, Animal Husbandry and Fisheries

Botswana's fisheries were estimated to contribute a fraction of a percent (0.002 %) to the GDP, and the sum contribution from agriculture, forestry, hunting and fisheries was about 2% in 2007. The relatively small contribution of fisheries is a result of Botswana being landlocked, and having few inland water bodies. The largest fishery resource in Botswana is the Okavango Delta Fishery, which accounts for about 80% of Botswana's catch. These fishing grounds are also a crucial livelihood for many communities along the Okavango Delta, accounting for over 3000 jobs in the primary sector.

The catch profile is mainly Tilapia, Sargochromis, and Clarias, while Tigerfish and other smaller species are consumed locally or bartered for agricultural produce. All the fish caught from the Okavango Delta is consumed by the local market. The final fifth of catch is predominantly from Botswana's dams including the Gaborone Dam, Bokaa Dam, Shashe Dam and Letsibogo Dam. The Chobe system – which includes a fairly extensive water area – contributes a fraction to national catch as much of the system is in the Chobe National park where fishing is not allowed, and Lake Liambezi, which was a very productive fishing ground in the past, has since dried up.

Trends in livestock population in Botswana shows that goats' numbers had increase from 1.1 million in 1985 to 2.6 million in 1997 and then started to decline. Those of sheep from 149 000 in 1980 to 409 000 in 1997 and then started to decline but those of cattle maintained numbers around 2.5 to 3.0 million (CSO 2004).

Botswana is a net importer of dairy products from neighboring countries; the government engaged consultants under NAMPAADD to come up with recommendations to enable Botswana to produce food for food security. This therefore means Botswana should make efforts to foster dairy development plans wherever the potential exists. This would considerably reduce the gap between production and consumption of dairy products in the country.

Modernization of the dairy industry along the lines of large scale enterprises (as found in developed countries) is the best strategy to ensure increased milk and dairy products. However, this model may not be adaptable under our conditions. Rather consideration should be accorded to the peculiarity in the indigenous livestock production systems to determine the extent of modification and adopt the model in order to ensure its successful application under our condition.

The MOA has conducted extensive studies on the subject and has prepared a comprehensive dairy handbook that tries to identify some of the fundamental issues in a profitable dairy enterprise. The key findings are that a minimum of 50 dairy cows is the recommended ideal herd size to give farmers a reasonable return to continue production and reduce milk imports. Furthermore, the output of Botswana's approximately 5000 dairy cows could be increased substantially, from the current average of around 10 liters of milk per cow per day to between 50 and 60 liters. Proper feeding strategies and a regular supply of fresh water would also assist in boosting output.

The term dairy breed is used to differentiate those cattle that are bred primarily to produce milk against those that are used for meat production. Dairy cattle may be defined as a particular group of animals developed in a certain area for a definite purpose and having the same general characteristics such as colour, conformation and quality of product i.e. milk. A purebred dairy cow is one whose ancestry traces back to the same breed. A registered dairy cow is a purebred that has been registered by a particular breed association. There are six (6) major dairy breeds of which 4 are widely found in Botswana: Friesians/Holsteins, Jerseys, Guernseys and Dairy Swiss (Braunveih). Dairy cattle not common in Botswana are Aryshires and Dairy Shorthorn.

About 80% of our cattle are produced in extensive communal/traditional grazing systems, and the reminder in commercial freehold and leasehold farms. Ranchers have exclusive rights over the use of rangeland resources and are able to practice improved and better management of both livestock and range resources (www.gov.bw).

Table 1. Horticulture production status of Botswana

Horticulture Crop	**Area (ha) planted**	**Estimated (tons)**	**Actual (tons)**	**Sales**
Vegetables				
Cabbage	57.32	2280	435.84	356204.14
Broccoli	0.92	18.4	0	1825
Green beans	0	0	0	0
Garden Peas	0	0	0	0
Radish	0	0	0	0
Cauliflower	0	0	0	0
Kovo	0	0	0	0
Ethiopian Mustard	1.458	29.2	2.164	13773
Chunga	0	0	0	0
Tomato	13	520	177.23	256385.5
Lettuce	0.257	3.75	0	0
Chilies	0.21	3.15	0.242	1751.1
Rapeseed	11.98	359.4	26.406	153345.75
Swiss Chard	3.806	26.6	18.626	67475.31

Choumolier	1.41	28.2	1.515	0
Onion	38.55	1542	2.6	0
Garlic	0.06	0.6	0	0
Spring Onion	0	0	0	0
Egg Plant	0.01	0.15	0.08	480
Baby Marrow	0	0	0.075	450
Butternut	4.73	118.25	174.93	306946.75
Courgettes	0	0	0	0
Green Mealies	0	0	0	0
Water Melons	0	0	0	0
Beetroot	0.92	13.8	0.42	1825.5
Carrots	0.01	0.2	9.25	0
Herbs	0.09	0.72	0.15	0
Pumpkins	0	0	0	0
Green Pepper	0.14	2.8	1.86	46425
Potatoes	15.32	612.8	9.6	0
Sweet Potatoes	0.36	7.2	1.47	4609
Okra	0	0	0.55	6600
Mushrooms	0	0	0	0
Cucumber	0.84	21	18.42	59570
TOTALS	**151.391**	**5588.22**	**881.428**	**1,277,666.05**

As summarized in Table 1, the country is producing various horticulture crops. Though the climate of the country is suitable for aforementioned horticulture crops, all crops are not produced and the quantity produced is not also adequate to feed the nation. As a result, Botswana currently imports substantial quantities of vegetables from neighboring countries amounting to millions of Pula annually. This is partly owing to the fact that the necessary information on vegetable production locally is not readily available to assist producers in their production.

Table 2. Fruit production status in Botswana

Horticulture Crops	Area (ha) planted	Estimated (tons)	Actual (tons)	Sales
Fruits				
Oranges	0	210	10.9	163530
Naatjies	0	0	0	0
Banana	0	0	0	0
Mango	0	0	0	0
Peaches	0	0	0	0
Guava	0	0	0	0
Pawpaw	0	0	0	0
Olive(3303)	0	0	0	0
Litchi	0	0	0	0
TOTALS	**0**	**210**	**10.9**	**163530**

Table 3. Estimated Total Crop Production, 2008/09 cropping Season Metric Tons

S.No	Sorghum	Maize	Millet	Pulses	Others	TOTAL
Total	34630.9	26305.72	4492.17	7906.15	10872.62	82331.56

Traditional (subsistence to semi-subsistence) system plays a crucial role in grain production in Botswana. For instance, this system accounted for an average of 89 percent of sorghum and maize cultivated area during 1979-90 and 1993 (Seleka, et. al., 2003). Moreover, it accounted for 78 and 53 percent of sorghum and maize output, respectively during this period. About 52 thousand households are engaged in traditional crop farming, compared with only 63 commercial farm households.

4. Present Status and Challenges in Agricultural Extension, Marketing, Insurance, Agricultural Mechanization, Food Processing, Infrastructure and any other relevant issues:

Major challenges facing agriculture in Botswana include production volume and efficiency; lack of infrastructure and support services. Many of production farms are scattered and this made the fulfilment of infrastructure and provision of extension services slow.

Technology transfer in Botswana is a challenge as several departments e.g. extension, DAR, and the farmers, are based in different locations these are issues of integration that are very complex for us to articulate and make sense when we talk to people. We are aware of these problems and try to liaise with colleagues in different departments and the communities and use different forums to share this information.

Access to Water: Nearly all of the grain is produced through rain-fed agriculture. This reliance on rainfall makes production as unreliable as the rainfall it intricately depends on. Soil moisture retention is low in many of Botswana's soils. This is also exacerbated by soil caking and layering resulting from inferior tilling technologies (Sustainable Agriculture and Rural Development, 2007). This challenge of limited soil moisture severely limits rainfed agriculture in Botswana. Other water-related challenges have to do with irrigation. Here the challenge is of underutilization of water resources for irrigation. Of the estimated 210,000m^3 of wastewater generated countrywide, only around Gaborone city is used for extensive horticulture. Due to low rainfall, estimated to decline even further due as a result of climate change (Department of Meteorological Services, 2011); the use of underground water for irrigation requires careful consideration. A number of aquifers are already being over-harvested just for human consumption (Central Statistics Office, 2009). The national water accounts of 2006 show that agriculture is the highest user of water but also the least productive (Department of Environmental Affairs, 2006). Vis-à-vis achieving a Green Economy, the livestock sector needs to increase productivity to justify the levels of water consumption. Opportunities include reducing amount of time spent by animals on the range before off take, increasing the calving frequency through systematic weaning, and placing emphasis on high productivity crops such as millet, sorghum and groundnuts.

Land-use Planning: The allocation of agricultural land has been user-driven with limited planning at community or district level on the location of various types of production system. This has made development of support infrastructure virtually inconceivable. The implementation of National Master Plan for Arable and Dairy Development (NAMPAADD) and related programmes aimed at improving productivity and access to inputs and markets will achieve better results if the land use planning targets to congregate activities of similar nature as this will reduce the costs of supporting infrastructure.

Livestock Production: Livestock has remained a significant sub-sector mainly due to the cattle industry. The main challenge is the weak linkages with markets. An extension service in its current state is concentrating on production and less on consumption. The Botswana Meat Commission (BMC) fails to meet its quota in the export market. Where it has, the prime markets have been inaccessible because of the sporadic supply and the differences in size of animals being slaughtered. However, based on the value-chain concept, meat production in Botswana still has potential to grow substantially even within the current resource-levels of rangeland, water and energy. The transformation needed is about market-led production where farmers understand that "someone is waiting in restaurant for a specific cut from part of their cow's carcass", and that a calf should be weaned for another to be born to complete the production cycle. This system applies to small stock too. Inputs to production and access to markets are also essential, and have largely been addressed except for the negating factors of scattered distribution of production centers (farms). Other value-chain opportunities for optimizing efficiencies within the livestock sub-sector include local utilization of skins, hides, tallow and other products from abattoirs.

Other challenges, affecting the broad range of farm animals is the lack of clustering of production centres. These affect the ability to access essential services such as water, energy, extension services, markets and product interchange (e.g. poultry manure and horticulture). About 94% of the total water flow in Botswana originates outside its borders. Future water availability will therefore require greater collective actions among countries sharing basins. Of particular importance is management of shared river basins. Water transfer schemes across more than one country may need to be considered in future.

Climate Change: The climate of Botswana is already characterized by high variability resulting in unpredictable trends in agricultural productivity. The decline in rainfall and rise in extreme weather events is a unique challenge to the agriculture sector as it puts to test many of the systems that have been in place over decades. The agricultural sector was identified as one of the most vulnerable to climate change in Botswana (Department of Meteorological Services, 2011). The heavy reliance of the sector on rainfall makes it vulnerable. The crop subsector has proven to be the most vulnerable. An added challenge is that of weather forecast and prediction of extreme weather events. Forecasting needs to be long-term to allow farmers to make choices on the crops to plant. Early detection of extreme weather events is also essential to allow farmers to prepare mitigation measures.

The frequency and intensity of flush rains posses its peculiar set of challenges affecting both the water and agriculture sector but requiring a coordinated response between the two.

Information, Technology and Extension: Technology in agriculture represents an important input essential for raising productivity levels. Technology includes both introduction of new equipment (as commonly understood) and new on-farm practices of using the same equipment and other resource differently and more efficiently. It indicates that extension is an integral part of technological innovation required to scale-up productivity in agriculture. A broad range of areas of technology include breeding, weaning, scheduled animal-sales, tillage, crop rotation and other technologies generally defined as conservation agriculture.

Marketing: Much agricultural production in Botswana is geared towards markets that are 'protected' in some way. This 'protection' is achieved through a combination of border closures (e.g. horticultural products), outright import bans (e.g. chicken meat), quantitative restrictions (e.g. grains). There is an over concentration of market power in a small number of farms and other enterprises operating in key sections of a number of agricultural value chains. The retail section of the food sector is largely owned and controlled by foreign nationals. Their distribution hubs are located in a foreign country with direct distribution to individual stores in Botswana. Unlike the case in many African countries there are no substantial 'green markets' or street vendors. Instead, the multiple stores or "lock up" shop sector accounts for over 80% of retail food sales in towns and larger villages. Production of certain agricultural products is also, similarly, highly concentrated. This is certainly the case for fruit and vegetable production where approximately two-thirds of the country's output is dominated by a handful of large farms. The import restrictions on chicken meat has led to increased production in Botswana but this is now largely concentrated in the hands of large producers.

5. Status of Agricultural Extension and Research system:

Agricultural extension: The Ministry of Agriculture provides free extension services to both crop and livestock farmers. There are several crop and livestock extension agents in the country whose main role is to advice farmers on technical aspects of farming. In addition the livestock extension agents also vaccinate cattle for a number of diseases

which are classified as of economic importance at free of charge. The MoA has unified the extension system through its new Department of Extension Coordinating Services.

The mandate of the Department of Extension Services Coordination is to coordinate all agricultural programs and projects in Botswana to enhance the performance of the agriculture sector. This mandate is supposed to be fulfilled by bringing together all professional departments of the Ministry of Agriculture that provide technical information to the farming communities, including functioning in a united fashion. The department was established to improve extension delivery and its core business is to provide technical advice and assistance to farmers who may include small-scale, emerging, progressive and commercial producers. Main functions of the department are:

- To coordinate agricultural extension services of the Ministry of Agriculture with the aim of improving agricultural productivity;
- To transfer knowledge and practical skills to various farming entrepreneurs;
- To intensify farm visits by frontline extension workers and subject-matter specialists who demonstrate the use of new technologies and increase their adoption rate

Field extension responsibilities have been allocated to six Regional Agricultural Coordinators who have under them a number of field extension workers to assist the farmers.

The Division of Farmer Training is responsible for training farmers in the transfer technologies. The Division comprises of five Rural Training Centes (Denmam, Francistown, Southern, Ngamiland and Mahalapye Rural Traing Centre) which offer training in all aspects of Crop Production, Animal Production, Marketing of Agricultural Produce, Agro-processing and Conservation of Natural Resources. Courses offered at these Centres ranges from one to six weeks.

Provision of Training and Breeding Stock for Pig Production

Piggery Section provides technical advice to the farming community on pig production, and management.

Agricultural Research: The Department of Agricultural Research (DAR) under the Ministry of Agriculture is responsible for agricultural research. The other organizations carrying out agricultural research are Botswana College of Agriculture, Rural Industries Innovation Centre (RIIC), the University of Botswana and the National Food Technology Research Centre. The main role of agricultural research in Botswana is to develop

appropriate technologies that reduce production constraints and increase productivity of crop and livestock enterprises. The Department of Agricultural Research has released a composite breed of beef animal which is presently being piloted in commercial ranches and is constructing an Animal Genetic Resource Centre at its headquarters in Sebele, Gaborone. In addition, Parliament recently passed a bill paving way for an animal testing centre, which will facilitate the development of Stud breeding in the country.

ISPAAD is one of the main Agricultural Support Schemes introduced in 2008 to address challenges in the arable sub-sector, of poor technology adoption by farmers and low productivity of the sub-sector. Seed Multiplication Unit is an official seed certifying agency in Botswana. Certification is limited to seed of officially recognized varieties, grown and inspected as to protect the varietal identity and genetic purity. The services provided include; seed certification and seed distribution.

The Division of Horticulture and Beekeeping is made up of four sections namely Vegetable Production, Fruit Production, Floriculture and Landscape Production and Beekeeping which are tasked to provide the following service:

- Facilitate establishment of horticulture and beekeeping projects.
- Transfer of technologies in order to maximize production, promote commercialization of the horticulture and beekeeping industries and promote diversification of the horticultural industry through production of non-traditional high value crops
- Conduct demonstrations, farm walks & field days to enhance technology adoption.
- Appraise farmer's projects.
- Assist the public to capture bees.
- Facilitate formation of producer associations

Botswana currently imports substantial quantities of vegetables from neighbouring countries amounting to millions of Pula annually. This is partly owing to the fact that the necessary information on vegetable production locally is not readily available to assist producers in their production. The National Master Plan for Agricultural Development identified vegetable production as one of the priority areas with potential for development in Botswana.

6. Public and private institutions and their relevance in Agricultural development

Department of Agricultural Business Promotion

The Department of Agricultural Business Promotion was established to promote the commercialized, diversified, sustainable and competitive agricultural sector through business skills transfer, market access negotiations, and promotion of agricultural cooperatives and associations. The vision of the department is to become a dynamic agribusiness advisory center of excellence. The department comprises divisions of agricultural cooperatives, farm management, agricultural trade and agricultural marketing.

Botswana College of Agriculture

The Botswana College of Agriculture (BCA) was established in 1991. It does not provide direct agricultural extension services. However, it is an important institution due to its academic program in extension, an in-service training institute, and the very fact that it is the only college of agricultural sciences in the country. BCA is a semi-autonomous institution under the Ministry of Agriculture, and an affiliate of the University of Botswana. The college is located at Content Farm in Sebele, a few miles away from the capital city Gaborone. BCA confers not only academic degrees on behalf of the University of Botswana, but it also offers a number of short training courses and diplomas in various agricultural disciplines through its Center for In-Service and Continuing Education. BCA also has Department of Agricultural Education and Economics which comprises three units, namely Agricultural economics, Agricultural education, and Agricultural extension, which offer degree programs. The college has a consulting arm called BCA Consult, which enjoys several technical areas of competence including agricultural education and extension.

Non-Public Institutions: Private sector

The private sector is already involved in many facets of agricultural extension especially in delivery of inputs. Governments can stimulate private sector participation in extension service delivery by providing conducive policy environment. However, the scope for private extension in Botswana is limited due to limited commercial agricultural activities in the country, and the limited access to infrastructure. Improvement in extension services should be geared towards facilitating well-functioning producer organisations for producer extension establishment and improving the working conditions of extension staff if they are expected to devote substantial time and efforts to extension work.

Non-governmental organizations

There is no known NGO in Botswana, which is really engaged in rural and agricultural development. Existing NGOs are more interested in welfare issues, human rights, women and youth programs, HIV/AIDS epidemic, and trade matters. Names of a few NGOs based in Botswana are as follows:

- BOCONGO (umbrella body for NGOs in Botswana)
- Ditshwanelo – The Botswana Center for Human Rights
- Emang Basadi Women's Association
- Botswana National Youth Council
- Botswana Federation of Trade Unions
- Botswana Secondary Teachers Union

These NGOs can be effectively employed to create awareness about good agricultural practices and quality production of crop and livestock enterprises.

Farmers-based associations, cooperatives and societies

Agricultural cooperatives in Botswana started in 1964 with the formation of Serowe Marketing Cooperative whose main purpose was to sell agricultural inputs and market farmers' livestock to Botswana Meat Commission. The oldest horticultural cooperative is Kolobeng Horticultural Cooperative Society, formed in 1975. Presently, two categories of cooperatives are most common: livestock marketing cooperatives, and arable/crop production cooperatives. The cooperatives are beneficial to their farmer members in many ways. Although no examples of extension services are being provided by any cooperative, yet the extension component may be incorporated in major activities undertaken for the benefit of member farmers. The Division of Agricultural Cooperatives of the Ministry of Agriculture, which has several regional offices, is responsible for the development of cooperatives.

Botswana has many farmers' associations which, like agricultural cooperatives, work for the benefit of their members. A few examples are given below.

- Northern Beekeepers Association, Tonota (North East)
- Mahabapi Small Scale Farmers Association, Pandamateng (North East)
- Dirang Livestock, Tati Town (North East)
- Ghanzi Beef Producers Association, Ghanzi (Kgalagadi)
- Kgatleng Piggery Association, Kgatleng
- Kgatleng Poultry Association, Kgatleng

- Botswana Poultry Association (Southern)
- Southern Horticulture Growers Association (Southern)
- Botswana Ostrich Farmers Association (BOFA)
- Botswana Pig Producers Association (BPPA)
- Botswana Poultry Association (BPA)
- National Dairy Association of Botswana (NDAB)
- Botswana Smallstock Association (BSA) and
- Botswana Cattle Producers Association (BCPA)

Agriculture Hub

The agricultural sector has been identified as one of the areas that has a good potential to diversify the economy and create employment, especially in rural areas. The Ministry is currently implementing several projects and initiatives which are intended to commercialise and diversify the sector. The Agricultural Hub has been established to be the driving force for the commercialisation and diversification of the Agricultural Sector in Botswana. Its aim is to develop an environment that will encourage, facilitate and support a viable and economically sustainable agricultural sector.

Operation

The Hub operates in conjunction with the Ministry of Agriculture and is in a position to fully interact with the other Hubs, Ministries, Parastatals, the private sector and other organisations. The Hub has been empowered to - recommend, negotiate, intervene and where needed cut red tape - to enable the timely implementation of the projects and initiatives that it is responsible for. In implementing its mandate, the Hub which will be staffed by a relatively small number of specialists, will operate at different levels with the various stakeholders to support their projects and initiatives. In so doing, the Hub will involve most, if not all, the different departments and sections of the Ministry of Agriculture.

PROJECTS AND INITIATIVES CURRENTLY FORMING PART OF THE HUB:

- National Agricultural Master Plan for Arable Agriculture and Dairy Development (NAMPAADD)
- Zambezi Integrated Agro-Commercial Development Project (ZIACDP)
- Agricultural Infrastructural Development Initiative (AIDI)
- Agricultural Service Centres (ASC as part of ISPAAD and NAMPAADD)
- Botswana Contributory Agricultural Insurance Scheme (BCAIS)
- State Farms around dams and sewage ponds (arable and horticultural)
- Botswana Meat Commission (GMR partnership)
- Banyana Ranch and other state owned ranches

7. Present capacity building programmes and potential areas

The extension staffs have mostly been trained at Botswana College of Agriculture (BCA) by way of courses which are mainly theoretical and with an estimated practical content of only 5%. This has led to substantial limitations in the capacity of the extension staff to deliver effective practical advice and help to real farmers, particularly in the context of marketing.

In Botswana, the UN achieves the programmatic pursuit of the norms and standards agreed by the UN general Assembly through the provision of global expertise, policy advice and technical assistance for capacity development in key priority areas with the aims of:

- Ensuring an enabling socio-political environment for the realization of human rights;
- Strengthening the development of inclusive policies and programmes;
- Strengthening data availability and use in policy and programme analysis and decision-making;
- Improving the institutional context for programmes (improving institutional arrangements and relationships for delivery, expanding spaces for participation, strengthening organization for participation, analysis of resources and adequacy of processes in relation to inclusion and legitimacy, among others);
- Strengthening the technical capacities for the design and implementation of programmes (by for example improving – knowledge, skills and demonstrating working models); and

- Extending service delivery to particularly vulnerable groups.

Registration for Agricultural Management Association

Agricultural groups which aspire to transform in to legally recognized entities may register as Agricultural Management Associations (AMAs). They are registered under Agricultural Management Associations Act number 18 0f 1986, chapter 35:08 , the purpose of which is to provide for the constitution, registration and control of agricultural management associations as well as provide for the rights, privileges, obligations and liabilities of members and related incidental matters.

8. Training priorities of the country in Agriculture and allied sectors

Millet, sorghum and groundnuts exhibit consistently higher production efficiency in Botswan. Due to their high protein value, they deserve to be promoted and supported through a range of policy instruments as a means of addressing rural poverty and nutrition.

According to Oakley and Garforth (1985), the success or failure of any extension programs is dependent on effective performance by extension agents. Unfortunately, majority of the agents are not sufficiently trained as the training programs are mostly technical and the outcome is usually an extension agent who has a general knowledge on a variety of subjects (Botha & Stillwell, 1997).

Job analysis is an important step in the development of training programmes as it describes the target job, its tasks, activities, and also specifies the skill requirements (Blunt & Papoola, 1985). Job analysis also provides invaluable information to training needs assessment (Spencer, 1983).

An extension agents' job comprises functions, processes, operations, tasks, and activities. An extension agent's job operation refers to the main objective of the job that the agents plan and set out to achieve when they are performing their job, while a job task is a plan needed to achieve the objective. A job activity refers to behavior that can be observed when an individual extension agent implements a job task in order to achieve a job operation (Pearn & Kandola, 1988). A typical job analysis determines the objective of a job, outlines the tasks, and activities that have to be performed in order to achieve the tasks (Wexley & Latham, 1991).

Tladi (2004) identified important job skills and mastery by extension agents. It provides indication on the skills that are required by agricultural workers to perform

agricultural activities in the way that it brings significant impact on the farming community.

Table 4. Important Job Skills and Mastery by Extension Agents

	Skill Importance	Skill Mastery
Skill Required to Perform the Job Well	Rank	Rank
General knowledge of crops grown in	1	5
Interpersonal communication skills	2	23
General knowledge of extension	3	2
Working with groups	4	7
Crop protection & pest control	5	9
Practical farm skills	6	16
Public speaking: Addressing meetings	7	15
Planning & conducting method	8	6
Vegetable production & pest control	9	10
Organizing effective field trips & farm walks	10	19
Writing minutes	11	1
Planning & setting up result demonstrations	12	8
Extension methods	13	3
Teaching adults	14	4
Fruit production	15	12
Forestry production	16	24
Maintenance of farm machinery	17	14
Diploma or higher level training in	18	25
Writing skills: writing reports	19	13
Organizing effective field days	20	20
Chairing meetings	21	17
Conducting needs assessment surveys	22	21
Mobilizing people to form groups	23	22
Preparing teaching aids for farmers	24	11
Bee keeping	25	18

As a summary of ranking results in Table 4, the mastery skills of extension workers are low in the areas of forestry production; interpersonal communication skills; practical farm skills; organizing effective field days; mobilizing people to form groups; conducting needs assessment surveys; organizing effective field trips and farm walks; crop protection and pest control; fruit production and planning; and setting up result demonstrations.

Crop production also continues to experience limits on its growth posed by recurring drought, limited skills, and inadequate use of improved technology. The job had 25 skill requirements that the agents had to master to enable them to perform their job well. The identified skills gaps are very useful for agricultural development which, in

turn, contributes to poverty reduction of the country. In-service training is the principal intervention mechanisms to tackle the problems. The National Master Plan for Agricultural Development identified vegetable production as one of the priority areas with potential for development in Botswana. The loss in the agricultural labour force through AIDS among the nine hardest-hit African countries, for the period 1985-2020, Botswana is projected to be 23 per cent. This trend could have at least four serious implications.

- Deepening and expanding poverty due to loss of income;
- An increasing shortage of farm labour required for production tasks such as land preparation, ploughing, sowing, weeding, harvesting, and post-harvesting activities;
- Drastic food shortages; and
- Increased vulnerability to the epidemic due to increased poverty and food insecurity. This is a vicious circle beginning with the start of the HIV infection of some persons and ending with the infection of many more persons.

The development of Botswana's agricultural sector is highly linked to the development of the following areas: in the other way, developing the following sectors address the agricultural extension workers as they are engines for agricultural development of the country. The contribution of the extension workers in the efforts of economic diversification is also high.

a. Private Sector Development

This involves supporting areas that promote an environment favoring private investment and competitiveness. The idea is to promote the development of viable, competitive and dynamic private sectors in African, Caribbean and Pacific (ACP) states. A number of areas are covered under private sector development, including financial, advisory, consultancy, and technical assistance; business information; consultancy capacity building; and technology transfer.

Fundamentally, the Cotonou Agreement (CA) talks about the provision of "finance, guarantee facilities and technical support" for the creation, establishment, expansion, diversification and rehabilitation of private enterprises. Therefore, Botswana 's private sector needs to seek support through this facility to promote agricultural competitiveness and diversification – but proposals should identify viable projects. It is

encouraged that the private sector takes an initiative in this case to determine how they can benefit to improve agricultural productivity. It appears that information dissemination needs to be improved, perhaps by the Ministry of Agriculture, to sensitize the private sector on areas of and procedures for possible EU support.

b. Institutional Strengthening and Capacity Building

One of the National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) strategies is to develop production cluster/groups for farmers to engage in collective activities in production and input/output marketing, to further reduce transaction costs. It is, therefore, necessary to strengthen farmers associations to improve their capacity to mobilize farmers. This is consistent with the CA objective to encourage the active participation of non-state actors in development initiatives. Therefore, the Botswana Agricultural Union (BAU) has to assist farmers and commodity associations to come up with projects under institutional strengthening and capacity building. Farmers have complained that their associations have inadequate capacity to mobilize them into effective, coherent and cohesive groups, and have depended almost entirely on government funding to undertake their activities in other words, farmers associations have failed to foster collective action among members.

Capacity building is not only relevant for farmers associations, but it also applies at individual farmer/farm level. Most farmers do not only lack farm-level technical skills, an area which needs to be aggressively developed to promote diversification, but they also lack entrepreneurial skills, which are necessary for the success of any business. Globalization implies the need for timely and appropriate response to the ever changing economic conditions; and without entrepreneurial skills, firms cannot respond adequately. Therefore, there is need for capacity building of farmers, and those involved in agricultural businesses, in entrepreneurship.

c. Technology Development and Transfer

One of the reasons for low agricultural productivity is that technology transfer is slow. One of the activities of NAMPAADD would be to promote the adoption of advanced farming techniques through on-farm training. This effort requires intensification; and therefore, there is need to fund more projects aiding farmers to improve their technical performance – some of these projects are implemented by non-state actors. As pointed out earlier, the poor performance of the agricultural sector mainly originates from low farm-level yields, and significant improvements at this level

would greatly improve agricultural performance.

Equally important is technology development by institutions conducting agricultural research. Research is not only about determining how crops and animals perform under different conditions, but it is also about improving their performance to further enhance their economic contribution. Research is a process where new areas are continually explored to determine if new opportunities do exist. Therefore, there is need to diversify agricultural research into new crops/animals/products. For example, one area for possible diversification is veld products research. This area requires intensive investigation by institutions mandated with agricultural research. Food technology research is another example, and there is need to intensify efforts in the area to promote value addition.

d. Infrastructural Development

It has been well established that a positive relationship exists between the level of infrastructure development and the level of economic development. Access to roads, telecommunications, and electricity, for example, may lead to productivity increases through reductions in transaction costs, and hence stimulate agricultural growth and diversification. The Ministry of Agriculture is currently undertaking a study on infrastructural needs in the country. There is also need to develop the necessary infrastructure for ensuring that Botswana has the capacity to comply with Sanitary and Phyto-Sanitary (SPS) measures in the EU market, and to ensure that imports into Botswana are SPS compliant.

e. Institutional Policy Development and Reform

It has been observed that policies needed to promote sectoral developments are sometimes missing, rigid, or inadequate. A relevant example here relates to land policies, which are said to be rigid. For example, farmers have to reapply to land boards before diversifying their production base – a horticultural farmer has to reapply to the relevant land board before adding a broiler or pig production enterprise. Because land boards are slow in processing applications, this often leads to loss of opportunities and reduces the responsiveness of farmers to dynamic economic conditions.

f. Improving capacity to enforce policies

Land boards, for example, do not repossess land that is continuously left idle, even though there are provisions for doing so. There is also need to develop or enhance local capacity to adhere to trade-related policies, measures or conventions, such as the competition policy; protection of intellectually property rights; standardization, certification, and quality assurance; SPS measures; trade and labor standards; and consumer health.

The agricultural production of the Botswana is tremendously decreasing form time to time. Thus, agricultures needs due consideration for fighting poverty particularly in the rural areas through strong and agricultural growth. For the purpose, it needs to capacitate extension workers which, in turn, help to exploit the existing resources.

Table 5. Priority Training Areas and Number of Extension Functionaries to be trained

S.No	**Sector**	**Training Priority Areas**	**No. of extension functionaries to be trained**
A.	**Crop Farming**		
1.		Improved crop production methods in millets and pulses	100
2.		Integrated weed management in field crops	50
3.		Plant protection management in field crops	50
4.		Post-harvest management	50
B.	**Horticulture**		
5.		Improved vegetable farming methods	20
6.		Seed production techniques in vegetables	20
7.		Improved fruit production techniques	10
C.	**Livestock and Fisheries**		
8.		Commercial dairy farming	100
9.		Value addition to beef meat	50
10.		Commercial poultry and piggery farming	100
11.		Reservoir fisheries management	50
12.		Advanced training in fish catch	25
13.		Improved methods of rabbit, guinea fowl, tswana chicken, piggery and small ruminant	100

		farming	
D.	**Natural Resource Management**		
14.		Climate proof technologies for resilient agriculture	100
15.		Rainwater harvesting and water conservation techniques	100
16.		Mixed farming and IFS models	50
17.		Improved techniques for fodder and range management	50
18.		Bee keeping and pollination	50
19.		Promotion of sprinkler and lift irrigation	100
E	**Extension Management**		
20.		PPP in input and extension delivery	100
21.		Mobile based technology dissemination	100
22.		Strengthening farmers co-operatives and producer companies	100
23.		Formulation of Commodity Interest Groups, Farmer Interest Groups, Commodity Association	100
24.		Rural Hygiene and sanitation/ Human health management	50
25.		Market intelligence and advanced marketing information tools	50
26.		Human-wildlife conflict management	50
27.		Youth centric models in agriculture	100
28.		Gender mainstreaming in agriculture	100
29.		Agri entrepreneurship in agriculture	100
30.		ICT application in agriculture	100

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