Adoption of Plant Breeders’ Rights System: Perceived Implication for Food, Seed Security and Sovereignty in Ghana

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This study assessed the level of awareness and knowledge among major stakeholders in the relevant sectors of agriculture on the Plant Breeders’ Rights (PBRs) Bill of Ghana and review the potential implication of adopting the PBRs system on food and seed security in Ghana based on stakeholders’ perception and case studies from other countries already implementing a PVP system. A field survey was conducted to administer questionnaires to participants comprising plant breeders, farmers, the general public, seed companies and Seed Producers Association, legal practitioners, National Research Institutions and the Registrar General’s Department (proposed regulatory body). The second part of the study is a review of historical data on PBRs system impact studies in Kenya, Tanzania and South Africa. The primary data were analysed using mainly descriptive statistics, employing Statistical Package for Social Sciences (SPSS), while the secondary data was analysed, contextualized and narrated. The current study confirmed the proposition that lack of and inadequate awareness and knowledge of the PBRs Bill among stakeholders could have stalled the passage of the Bill. Majority of farmers (61%) were not aware of the existence of the PBRs Bill and as high as between 70-79% lacked knowledge or understanding of the basic provisions of the PBR Bill, including the “farmers’ privilege” provision. Six out of ten (63%) farmers in Ghana continue to rely on their saved seeds, exchange or purchase from local grain markets for planting with only 12% purchasing seeds from Agro-dealer shops. The adoption of PBRs system in Ghana has the potential to improve the seed and food security system provided the recommendations offered by various stakeholders are thoughtfully considered.

Keywords: IPRs, PBR, PVP, seed security, TRIPS, food security, farmers’ privilege

There has been increasing attention in the past few years to strengthen the intellectual property rights (IPRs) in plant breeding in developing countries including Ghana. One of such international agreements that sought to push this agenda is the Agreement on Trade Related Aspects of Intellectual Property Rights, TRIPS, of the World Trade Organization (WTO). This agreement requires all WTO members to introduce at least a minimum level of protection in their national laws for plant varieties (Article 27.3 (b) of TRIPS, 1994). Thus, in compliance with this obligation, the government of Ghana as a member of the African Regional Intellectual Property Organization (ARIPO) is making preparations to join the International Union for the Protection of New Varieties of Plants (UPOV). However, as a requirement, Ghana has developed a Plant Breeders’ Rights Bill, which is currently before its Parliament awaiting passage.

This Bill (PBR) seeks to establish a legal system for protection of plant breeders’ rights in order to put in place a mechanism for rewarding plant breeders and for the purpose of promoting plant breeding activities to stimulate and promote agricultural development and particularly to ensure food security in the country.\textsuperscript{1}

The provisions of this Bill were framed to be largely consistent (‘a copy cut’) with the UPOV-91 Convention. Consequently, sections of Ghanaians especially the civil society and other farmer organizations think the UPOV-91 Convention possesses antagonistic clauses, which they perceive to have negative implication for Ghana’s food, seed security and sovereignty if adopted. Some claim there is lack of or inadequate awareness and knowledge among stakeholders and general public on the implication of adopting such a system to food security. Moreover, they claim there is lack of or inadequate consideration for the legal, economic implications and more importantly issues of farmers’ rights and privileges have been poorly addressed in the current PBR Bill of Ghana.\textsuperscript{2} Other claims include the perception that access to seeds by small holder

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farmers will be restricted while others think the country is not prepared in terms of human resource and infrastructure to efficiently implement a plant variety protection system among others. However, all these remain claims with no systematic study to validate the same. Thus, it became necessary that a study to assess the level of awareness and knowledge among major stakeholders in the relevant sectors of agriculture on the Plant Breeders’ Rights Bill and the perceived implication of adopting this system on food and seed security in Ghana based on stakeholders’ perception and case studies from countries already implementing a PVP system be conducted.

A field survey using interview questionnaires with both structured and unstructured questions were administered to 117 respondents comprising plant breeders, farmers, the general public, seed companies and Seed Producers Association, legal practitioners, National Research Institutions and the Registrar General’s Department (proposed regulatory body). Some respondents were randomly selected while others were purposively sampled. The second part of the study was a review of historical data on PBRs system impact studies in Kenya, Tanzania and South Africa. The primary data were analysed using mainly descriptive statistics, employing Statistical Package for Social Sciences (SPSS), while the secondary data was analysed, contextualized and narrated.

Awareness and Knowledge of Basic Provisions in PBR Bill of Ghana Among Major Stakeholders

The study revealed that majority of farmers (61%) is not aware of the existence of the Plant Breeders’ Rights Bill. However, 68% of the general public and 100% of legal persons, Breeders and Seed companies or Producers are aware of the existence of the PBRs (Fig. 1).

Thus, the level of awareness differed among the stakeholders and this may corroborate with the claim by civil societies and other sections of the public that “many Ghanaians are not aware of or understand what is contained in the Plant Breeders’ Bill. There has not been adequate public education and consensus on the Bill. We are alarmed by attempts by Parliament to pass the Bill without adequate consultation with key stakeholders including the Faith-Based Organizations.”

The lack of or inadequate consultation and awareness raising campaigns in the development of the PBR Bill could have stalled its passage into Law. Again, the medium through which stakeholders became aware of the PBRs Bill differed. While majority (64%) of farmers became aware through organized awareness workshop, none were consulted compared to 80% of legal persons, 20% of Plant Breeders and 29% Seed companies and producers interviewed (Table 1). The general public however, relied mainly on TV and Radio discussions for information on the PBRs Bill.

According to Maastricht principles, Article 7 states that

“Everyone has the right to informed participation in decisions which affect their human rights. States should consult with relevant national mechanisms, including parliaments, and civil society, in the design and implementation of policies and measures relevant to their obligations in relation to economic, social and cultural rights.”

A report by Berne Declaration on a similar study to assess the potential impact of the adoption of UPOV-91 convention in some developing countries indicated that in Kenya and Peru, there was insufficient participation of stakeholders who are likely to be affected in the process of revising or adapting the PVP laws. The authors of the same

Table 1—Medium of awareness in different stakeholders for PBR Bill

<table>
<thead>
<tr>
<th>Medium of awareness</th>
<th>Category of respondents &amp; percentages (%)</th>
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<tr>
<td></td>
<td>Farmers</td>
</tr>
<tr>
<td>Awareness Workshops</td>
<td></td>
</tr>
<tr>
<td>TV Discussions</td>
<td>64</td>
</tr>
<tr>
<td>Radio Discussions</td>
<td>5</td>
</tr>
<tr>
<td>Newspaper</td>
<td>32</td>
</tr>
<tr>
<td>Internet</td>
<td>0</td>
</tr>
<tr>
<td>Consulted or Participated in</td>
<td>0</td>
</tr>
<tr>
<td>Drafting the Bill</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
</tr>
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</table>
report alluded to the fact that such practice is likely to increase the likelihood of enacting laws and policies that are themselves not human rights-compliant and the implementation of such laws could be challenging.

In the case of Ghana, according to this study, it seems that consultation in the drafting process of the PBR Bill was not wide enough, and that could result in series of agitations including court injunctions that have delayed the passage of the Bill into Law. It must however, be indicated that it is one thing to be aware of the existence of something and another thing to understand what that thing stands for. Like in the case of South Africa, farmers have the privilege of even re-selling a protected variety legally purchased as well as saving to plant on their “own holdings” without infringing on the rights of the Breeder (Plant Breeders’ Rights Act 1976 of Republic of South Africa as amended Plant Breeders’ Rights Amendment Act, No. 15 of 1996). However, a study to solicit the level of understanding among farmers on this provision in the PBR Act concluded that the level of awareness and understanding of the Plant Breeders’ Rights Act and the farmers’ privilege concept is very low among small holder farmers.5

For instance, 70% of farmers interviewed do not know that the current PBRs Bill will not allow them to reproduce, produce, and sell etc. a protected variety unless he/she is granted permission to do so by the right holder of the variety. Furthermore, 75% of farmers and 78% of the general public do not know that they cannot exchange or sell in commercial quantities a protected variety unless granted permission.6 However, it must be noted that PVP systems and the UPOV-91 convention protects only ‘Newly’ developed crop varieties and not traditional varieties or landraces mostly used by these smallholder farmers. Hence, the UPOV-91 system under no circumstance would prevent this long-observed practice of seed-saving by farmers, if they choose to continue to use their own saved planting materials.

In Ghana, although there exist nascent local seed companies involved in seed production and distribution; the seed system operates mostly in informal manner.7 In fact, six out of ten, (63%) of small holder farmers in Ghana mainly source their seeds from the informal channels which include farmers’ own saved seeds, seed exchanges among farmers and purchases from the local grain or seed

| Table 2—Level of knowledge or understanding of basic provisions of the PBR Bill |
|----------------------------------|------------------|------------------|------------------|------------------|------------------|
| Basic PBR Bill Provision         | Category of respondents and percentages |
| 1 The law doesn’t allow to reproduce protected variety unless granted permission by the owner | Farmers: 30 (70) | General public: 32.4(67.6) | Legal persons: 100 (0) | Breeders: 90 (10) | Seed companies: 25 (75) |
| 2 One can’t exchange or sell in commercial quantities protected variety after buying unless granted permission by the owner | Yes: 24.6(75.4) | Yes: 21 (79) | n/a | n/a |
| 3 One can use a saved seed of a protected variety for replanting only on your own land | Yes: 24.6(75.4) | Yes: 21 (79) | n/a | n/a |

NB: % responded No
markets as revealed in this study (Fig. 2), and could be higher (over 80%) elsewhere in the sub-region, corroborating earlier observations. Interestingly, the study also reveals that as high as 81% of farmers interviewed do not buy seeds annually for planting (Fig. 3). The rate of purchased seeds by farmers ranges from once in 2 years to once in 10 years. Slightly more than half (56%) of them buy seeds once in 3 years while 7% farmers’ rate of purchase is dependent on available purchasing power (money).

This result supports an earlier assertion that a significant number of farmers in Africa acquire their seeds from the local grain market, a risky practice given the fact that they often cannot reliably identify the variety they are purchasing. Although, on the contrary to the latter point, as high as 74% of farmers said they know the variety they grow according to this study (data not presented). This has been the practice of many small holder farmers in most developing countries.

The practice of seed-saving among small holder farmers in most developing countries could be attributed to several reasons including but not limited to the size of land been cultivated by these farmers – less than 2 hectares and this represents 80% of all farms and contribute up to 90% of food production in some Sub-Saharan Africa countries. Another reason to justify smallholder farmers’ practice of seed-saving is the extra income they obtain by selling off surplus saved seeds on the local market. According to Lipper et al., these farmer-to-farmer practices of seed saving and exchange also contribute to the conservation and development of locally adapted crops that fit the specific (and often challenging) agro-ecological conditions in which these farmers have to operate. What then will be the implication for these small holder farmers if they are to comply with Clause 21 (2) and (3a; b) of Ghana Plant Breeders Rights Bill, 2013 in terms of access to seeds of their preferred variety and incomes they obtain through exchange and selling on the local market as well as addressing issues conservation of locally adaptable crops?

Surprisingly from the study, it was revealed that majority of farmers interviewed do not perceive the PBRs Bill to affect their access to seeds of their preferred crop variety (Fig. 4). Persons of legal background share similar perception (80%) while the general public (62%) think certain provisions in the current Bill have the potential of affecting farmers’ access to crops of their preferred varieties. The farmers’ observation could be attributed to their lack of understanding or knowledge of the basic provisions of the PBR bill. This is because one of the most determining factors for growing a particular crop/variety according to these farmers is easy access to seeds (Fig. 5), followed by crop/variety most preferred within the community. The cost of seeds, yield and quality therein the crop/variety is less considered in making a choice as to what crop or variety to grow. This observation implies that, any legislation or system that seeks to make access to
seeds difficult by farmers could be detrimental to the well-being of these farmers. This observation by farmers notwithstanding, the UPOV-91 system defines small farmer as someone who cultivates 5 hectares of land. It must be noted that majority of farmers in Sub-Saharan Africa cultivate less than 2 hectares and this represents 80% of all farms and contribute up to 90% of food production. Nonetheless, it is imperative to balance commercial and smallholder farmers’ interests to avoid the current resistance that has stalled the passage of the PBRs Bill in the case of Ghana. This can be achieved by engaging farmers and other stakeholders to offer other alternatives including recognizing the importance of informal seed systems for the provision of seed in the country and how efforts of Plant Breeders will also be rewarded.

Private and Public Sector Involvement in Plant Breeding Activities

One major justification for the introduction of the PBR system in Ghana like in many other developing countries is to provide a legal framework that will serve as bait for private sector investment in agricultural research and plant breeding activities. Thus, the second objective of this study was to examine the level of private sector investment in plant breeding activities and to what extent will the PBR system increase investment in plant breeding activities and development of agricultural related technologies especially by the private sector. The response to this question was based on the perception of Plant Breeding institutions (NARs) and Breeders as players in the Seed Industry. Currently in Ghana, 90% of plant breeding activities is donor funded with only 10% coming from the public (GoG), with no private sector funding (Fig. 6). However, the private sector is seen to be involved (10%) in terms of up-scaling other agricultural-related activities/technologies with commercial viability (Table 4) but not specifically on plant breeding or crop improvement activities (Table 3).

One touted reason for inviting the private sector to invest in agricultural research has been the consistent decline of public investments and interest. This phenomenon exists despite massive evidence available to the effect that public investment in the development of genetically improved crop plants can immensely improve a country’s economy; reduce food insecurity, malnutrition and poverty, while increasing incomes of small holder farmers. Unfortunately, public investments in agricultural research, have not kept pace with these acknowledged needs in most part of the developing world, Ghana inclusive. Despite the difficulty in accessing actual budgetary allocations to national research institutions for crop improvement activities/plant breeding in Ghana, an institute included in this study responded in

<table>
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<tr>
<th>National Research Institute (NARIs)</th>
<th>Number of crops developed</th>
<th>Total</th>
<th>Funding type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savanna Agricultural Research Institute (SARI)</td>
<td>Maize 4</td>
<td>10*</td>
<td>17</td>
</tr>
<tr>
<td>Crops Research Institute, (CRI)</td>
<td>Rice 3</td>
<td>Cowpea 3</td>
<td>Soybean 3</td>
</tr>
</tbody>
</table>

*5 Rice varieties jointly released with CRI (thus not counted in CRI varieties)

**Peppers
the negative when asked whether the institute has been receiving funding purposely for plant breeding activities for the last 10 years. Thus, the need for a system that creates an enabling environment to encourage private sector investment is long overdue. More, so is the fact that the effects of global climate change is been felt across the country, demanding an equally more environmental friendly adaptive mechanisms such as availing to small holder farmers locally adapted improved crop varieties to forestall any potential food insecurity threats. The impact of such legal frameworks (PVP) has been witnessed in the developed world,\(^{16}\) where introduction of a PVP system led to rapid growth in the number of private seed companies and greater availability of improved crop varieties such as Kenya, South Africa and parts of Asia.\(^{17}\) However, some are of the view that the “trade-offs are quite different” for both regions (the developed and developing) and whether the crops so developed will be of economic importance to these developing countries.\(^{18,19}\) Thus, the study also sought the perception of major players who are likely to be directly or indirectly affected by the PVP system when adopted. Major stakeholders like Plant Breeders and Seed companies/producers strongly agree (75\%) that the adoption of a PVP system will lead to an increase in the number of new and improved crop varieties. Moreover, they strongly agree (50\%) that PVP system will stimulate private sector investment in plant breeding. Their reasons for this strong opinion have been summarized in Boxes 1 and 2.

**Institutional Capacity Available for the Effective Implementation of PBR System**

It has been indicated that PVP/PBRs system comes with several implications including the cost of implementation. Thus, the study sought to assess the level of preparedness by the key players who will be implementing and managing the system when adopted. Although, several institutions are involved, the study limited itself to the Registrar-General’s Department (the proposed regulatory body for administrative functions), Plant Breeding Institutions and Breeders. The investigation again limited itself to technical human resource for DUS Testing and physical infrastructure for administrative functions. In sharing his experience on the challenges of implementing the PVP/PBR system in Tanzania Ngwediagi, indicated that “DUS testing requires detailed observations of characteristics where experts need to make a distinction between crop variation caused by genotypic differences and crop variation caused by environmental factors and this affected the regulatory system”.\(^ {20}\) In the case of Ghana, however, the study revealed that a total of 9 Plant Breeders interviewed have been trained in DUS Testing while about 10 legal persons at the Registrar-General’s Department have received various levels of training in PVP management, particularly administrative functions.\(^ {21}\) Moreover, there also exists in these national research institutions a reasonable number of facilities to conduct DUS tests for some major crops in Ghana. This information is critical to help decide, which system of PBR administration and DUS testing procedure will be suitable for Ghana. Should DUS testing be carried out by us as a nation? If so, should it be centralized or use existing national research institutes (NARs) across the country? If NARs or Breeders are to be tasked to conduct on behalf of the state, will the test results be independent and generally accepted if the same NARs who bred these varieties and have applied for PBRs on same are to conduct the testing themselves. In the absence of the regulation to this Bill, stakeholders should critically consider these issues during the drafting of the Regulations to the Bill. Should Ghana based on insufficient infrastructure (human, funding and physical) opt for just taking test reports from other countries? In respect to the latter, the PBR Bill makes provision in Clause 14(5) (a) and (b) that, the Registrar may engage a relevant authority or person within and outside the country to carry out tests to conduct the determine whether a variety submitted for registration and protection is (i) new (ii) distinct, (iii) uniform, or (iv) stable. The registrar may also use the results of tests that have already been carried out.

**Box 1—Perception of Plant Breeders in Ghana on a PBR/PVP system**

<table>
<thead>
<tr>
<th>NARIs</th>
<th>Number of Agri–related technologies developed</th>
<th>Total Funding type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savanna Agricultural Research Institute (SARI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free Convention</td>
<td>3*</td>
<td>10%</td>
</tr>
<tr>
<td>Greenhouse Dryer</td>
<td>Private &amp; Donor</td>
<td>90%</td>
</tr>
<tr>
<td>Solar Blanching</td>
<td>Management</td>
<td>funded</td>
</tr>
</tbody>
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*In the last 5 years*
1. Once breeders are ensured of royalties following enactment of PBR in Ghana, it can be boldly said that more varieties on different crops will be released and this will assist in reducing food insecurity.

2. The major problem facing the country is that the public is not educated about the Bill. The confusion is arising by being compared it with the GMOs, but the Bill will allow for innovation and private investment into plant breeding and will thus lead to the rapid development of new improved varieties.

3. The Plant Variety Protection System will encourage more commercial approach to breeding.

4. There will be enough funds for breeding activities; more private companies will venture into plant breeding and superior varieties will be developed and released to farmers.

Box 2—Perception of Local Seed Companies/Producers in Ghana on a PBR/PVP system

1. The Bill will make breeders sit up and do better job. If the materials do not get commercialized, as the people are being crazy, then the money is not made.

2. The impact will be marginal as nothing concrete is being done to support the private sector to develop enough capacity to be able to engage their own breeders or make enough money to buy rights to preferred varieties.

3. This is the only way by which advancement towards National Sovereignty in Agriculture can be made. It will keep the Scientists in Business. Moreover, enough Funds can be generated to support Research.

Experiences of Case Study Countries (Kenya, Tanzania and South Africa) PVP Systems

Summary of the Case Study Review

The possible implications for the adoption and implementation of a PBR/PVP system in the developing countries have been very contentious and divergent. For instance, a report by GRAIN indicated that PBRs do not promote the development of indigenous research capacity as claimed. Additionally, PBRs seem to favour foreign plant breeding institutes and multinational seed companies at the detriment of national institutes and local seed companies. Others also hold the view that PBRs seek to promote non-food crops and this has the potential of threatening food security in these developing countries. Most of the arguments are made in the context of African agricultural systems, which possess unique long-observed practices and traditions unlike the developed world. It is characterized by a sense of communism, hence sharing and exchanging valuable resources such as seeds/planting materials is a known tradition. Thus, any system that seeks to change this trend would certainly be confronted with high sense of scepticism. That notwithstanding, empirical evidence also abound to demonstrate the contribution of intellectual property rights and particularly plant breeders’ rights or plant variety protection system has played in various economies. The following observations were made from the case study review, which Ghana, who is yet to join such a system could rely on for direction and guidance.

In Kenya, it was revealed that the number of residents/nationals who applied for PBR (1997 – 2003) increased gradually and was highest in 2001 (164) out of a total of 197 applications. Many authors argue that PBR encourages protection on non-food crops and that is likely to shift breeding attention to these crops. In Kenya and South Africa, although the number of plants protected under PVP was highest for ornamentals, the number of crops that can secure food security to the people of Kenya protected under PVP is also appreciable. For instance, from 1997 to 2004, as high as 55 Maize, 30 Wheat, 7 Sorghum and Barley varieties were applied for protection under the system. However, the number of applications filed for food crops from 2012 to November, 2014 have drastically reduced. Only 8 food crops each for 2012/2013 and 10 for 2014 were filed compared to 52, 67 and 8 applications filed for Roses respectively. That notwithstanding, the general trend of release of superior varieties has increased tremendously from a little over 20 in 2003/2004 to over 250 in 2012/2013. It must also be noted that ornamentals are equally potential source of income into an economy and contribute the Gross Domestic Product of an economy through foreign exchange. In Kenya, the number of newly registered seed companies rose from 2 before the adoption of PVP system to 15 (1996-2000), 27 (2001-2005), 34 (2006-2010) and 46 (2011-2014). Across the countries used as case study, the following observations were made in respect of the effect of well-managed PBRs or PVP system could have

...
on the economy of a country; a PBR/PVP system has the potential to-

1. Increase private sector investment in the development of new and improved crop varieties, to make available quality seeds to farmers,

2. Increase foreign germplasm that can be used to further develop locally adaptable crop varieties to combat the current climate change challenges, using the “flexibilities” that exist under the UPOV system,

3. Increase foreign direct investment through PVP applications and technology transfer, especially in the horticultural sector, thus increasing foreign exchange earnings, diversifying Ghana’s export portfolio. This also has the potential of job creation for many unemployed youth in the country,

4. Reward and motivate local plant breeders to work hard in developing locally adaptable materials to meet the needs of their consumers, especially farmers and the general public,

5. Increase and expand the seed industry, making available a wide variety of crop portfolio for farmers to choose from, thereby increasing crop productivity and incomes of these farmers,

6. Increase access to seeds by farmers as a result of like competition within the seed industry.

**Conclusion**

Ghana has structures in terms of expertise and the will power coupled with the political stability and suitable climatic conditions to exploit its potential fully in diversifying its export portfolio and more importantly ensuring food security for its increasing population. Thus, creating a legal framework that encourages and stimulates the private sector’s participation in agricultural research and plant breeding in particular which has over the last decade witnessed a drastic decline in government funding. Majority of the stakeholders who will directly and indirectly be affected by the adoption and implementation of a PVP/PBRs system are of the perception that this system has the potential to improve the seed and food security system of Ghana provided the recommendations offered by various stakeholders are thoughtfully considered. Some of the recommendations for consideration by various stakeholders looking forward to adopting a PVP system that is responsive to the rights of all major players especially plant breeders, private sector, farmers and general public include-

1. There should be increased awareness raising campaigns to engage major players who will directly or indirectly be affected by the adoption and implementation of the PBRs Bill. Specifically, basic key provisions of the bill should be explained to their understanding using effective media channels depending on the target audience as revealed by this study.

2. To accommodate farmers’ right or privilege, Clause 21 of the Plant Breeders Right Act (Bill), 2013 of Ghana can further indicate or define what size of land constitutes “own holding” as been proposed in the ARIPO PVP draft to ensure that small holder farmers in the category of subsistence farming are not adversely affected.

3. Government of Ghana should promote and increase plant breeding activities at public institutions by way of investing especially, in “orphan” crops development. In that respect government may determine the terms of protection, the conditions of restrictions and exemptions. In this manner, small holder farmers can have access to plant varieties, especially those important for food security but not of commercial value for private sector (seed companies and private plant breeders).

4. To allay the fears of sections of the public and farmers that landraces and locally adapted genetic resources will be eroded because of the possible shift in breeding activities from “seemingly non-commercially valuable crops, in a PVP/PBRs system, investments can be made in germplasm conservation facilities for both in-situ and ex-situ purposes. Again, separate legislations based on Convention on Biological Diversity (CBD, Nagoya Protocol) and International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) Agreements can be enacted to ensure genetic resource conservation, sustainability and benefit-sharing arrangements are effectively catered for.

5. For further research purposes, there is the need to establish a baseline data on the current investments in breeding programmes both at research and the seed industry level to serve as pre-Plant Breeders’ Rights/Plant Variety Protection system to enable a more concrete impact study post-Plant Breeders’ Right system introduction in Ghana.
References


