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Seeds Without Borders

By: Mary Mgonja; ICRISAT; PO Box 39063 Nairobi, Kenya*Bean seed production by small-holder farmers in Zimbabwe*

It is the objective of this policy brief to review, reflect and discuss the challenges from the perspectives of technological, organizational, institutional, regulatory, and policy frameworks within the variety development-seed production-seed use continuum. This policy brief proposes recommendations that can be pursued to further enhance the efficiency of the seed systems especially in supporting regional seed marketing and ensuring that women as “natural custodians of seed” benefit from the improved systems.

1.0 CONTEXT AND IMPORTANCE OF THE PROBLEM

In the global context of food security, seed gives the highest ‘bang for the buck’ of any agricultural investment and is the basic input in agriculture. The use of quality seed of improved varieties and hybrids with in-built mechanisms to resist most of the prevailing biotic and abiotic stresses is often the most cost-

effective form of improved technology for productivity enhancement and increasing economic returns from production systems. Seed is the most easily adopted technology by farmers and is also a key input for improving agricultural productivity and ensuring food security. It is also a preferred tool for re-establishing the livelihoods of farmers affected by disasters and to return them to a life of dignity and devoid of hand-outs. Evolving seed “technology” is the conglomeration of the repository of knowledge passed from one generation to another, and the result of continual adaptation and innovation in the face of ever-greater challenges for survival.

Agricultural productivity in sub-Saharan Africa is continuously on the decline and this has a direct effect on food security impacting on the health, nutrition and welfare of many rural families and more so the women and children residing in the rural areas. The on-going famine in the Horn of Africa region is the sad proof that the challenge of feeding the world's growing population is more acute than ever. The United Nation's Food and Agricultural Organization (FAO) puts the number of people starving at almost a billion (<http://www.dw-world.de/dw/article/0,,15280850,00.html?maca=en-rss-en-all-1573-xml-atom>).

Agriculture is becoming more vulnerable to climate change than any other sector and a major integrated effort to address this challenge is virtually obligatory. Climate-smart agriculture, including scaled-up research on quality seeds of improved cultivars as a key entry point, and cross-border strategies for drought risk reduction are essential over the medium- and long-term. In this scenario, women and children are the most affected groups, yet few dispute that women constitute a significant majority of smallholder farmers and food producers. Some widely quoted estimates suggest that: 1)70% of the world's income poor are women (UNIDO 1995); 2) Agriculture is a critical source of livelihood and a key pathway out of poverty in many developing countries in Africa and Asia 3) The increasing feminization of agricultural work in Africa, the oft-cited figures of women in agriculture are 70-80 percent with their major roles in planting, weeding, post-harvest processing and production of basic food stuff for household consumption and sale. Hence, improvement in women's economic status and empowering them to actively participate in better and efficient agricultural production to consumption systems is required to meet the need for food security and household welfare in rural areas of the developing world. Linking women to the potential benefits from the use of good quality seed of adapted varieties and hybrids can be of enormous value, and the availability of quality seed of a wide range of varieties and crops to farmers can increase productivity, reduce risks from pests, drought and disease pressure, and increase incomes. Production increases through the use of adapted varieties in a given area can create employment opportunities related to seed processing, marketing, and other activities generated through quality seed production (ASBP 2006).

The number of farmers in sub-Saharan Africa who purchase high yielding varieties of seeds from formal institutions such as parastatal seed organizations and private seed companies, ranges from 5-10 per cent, and these are mainly the high income farmers. This is due to the fact that a large percentage of farmers use their own seed stock, or seeds obtained from other farmers in their communities. In this informal seed system, women play a key role in seed management –that includes selection, cleaning, conditioning, preservation, sharing and use (Amri and Kimaro, 2010). It is therefore imperative to note that strategies and interventions to improve the “seed system” value chain must bring a woman into the equation.

A “seed system” is a broader concept of technological, organizational, institutional, regulatory, and policy framework



Poor quality seed sold in some informal markets

within the variety development-seed production-seed use continuum. A seed system generally encompasses a large number of individuals, organizations, and institutions involved in different functions related to seed, such as plant breeding research and the subsequent multiplication, processing, storage, distribution, and marketing. Seed systems, very broadly defined, can be categorized as informal (or traditional) or formal seed systems. Individual farm households are the foundation for informal seed systems, in which each household performs numerous seed system functions on its own and these functions are at the woman's domain (Amri and Kimaro, 2010). The formal sector, by contrast, consists of public and private organizations with specialized roles in supplying seed of new varieties. Different types of seed from organizations and individuals in one stage of the seed chain will flow to the next stage through informal and formal channels. Rules and regulations, such as procedures for releasing new varieties of seed to the public, intellectual property rights regimes, seed certification programs, seed standards, and contract law, influence the structure, coordination, and performance of the seed system (Maredia and Howard, 1998). Irrespective of the crop, the overall performance and efficiency of a seed system can be measured by a combination of factors in the ‘seed value chain’ from developing well adapted farmer/end user preferred varieties to building an effective seed market to reach farmers. While availability of hybrids and open pollinated varieties holds great promise in all crops, much of the agricultural research and seed delivery is dominated by the public sector. To date, neither the public sector nor the emerging private sector has an effective seed delivery strategy and is able to provide seed of improved cultivars, particularly to small-scale farmers in less favourable areas and remote isolated regions (Bishaw, 2004, Ndjeunga. 2002; Diakité et al., 2008 and McGuire, 2007).

An apparent gender bias exists in access to formal seed systems. Men, who are generally more involved in growing commercial crops, seem to access and benefit more easily from formal systems. Women, in turn, because of their focus on food crops, operate mainly in the informal system and deploy either landraces or improved varieties but with a compromise on seed quality. It is worth noting therefore that weak seed delivery systems are often cited as a major constraint for adoption of improved crop varieties (Diakit e et al., 2008; Aw-Hassan et al., 2008).

2.0 CHALLENGES IN THE SEED SYSTEM

Seed systems are often large and complex. The challenges facing “the seed systems” are in almost all the nodes of the seed value chain and these are experienced by both the commercial farmers who rely mostly on formal systems, and by small scale farmer who are more reliant on the informal system (Sperling and Cooper 2003). The seed value chain involves developing improved cultivars, release and registration, seed production, certification and quality assurance, conditioning, processing, packaging and marketing.

2.1 Seed marketing, organizational and institutional arrangements

Starting from the seed marketing node, virtually all countries in SADC host private seed companies. However, most of these are too small and with limited trade volume to support significant commercial investment – especially for most secondary crops including low value crops, self and open pollinated crops that are of limited value to the profit orientation of the commercial seed companies. Most regional seed trade is financed either directly or indirectly through donor grants supporting drought relief, flood relief, resettlement and special development programs. This concessionary market has stimulated the establishment of a number of new seed companies during the past 15 years. But this market is highly variable, and depends on the continuing interest of external donors. Ultimately, the limited size of the seed industry in the region, and its heavy dependence on the relief and development market, results in three major weaknesses. First, seed companies concentrate on the production and sale of a few commercial crops. Second, the level of stocks of any given seed crop are limited. Seed supplies remain particularly limited for open pollinated food crops commonly grown in drought prone regions. Third, investments in the development of retail distribution systems are limited and few farmers can purchase seed at a nearby shop. There have also been weak institutional arrangements, deficient infrastructure for public seed enterprises and emerging private seed companies, lack of adequate information on existing and new varieties and crop technologies, and inadequate knowledge in seed business compounded by farmers’

socio-economic circumstances which contribute to these situations. On the other hand, commercial seed companies face several constraints to seed trade. Most countries require that a new variety undergoes several years – typically three - of testing before applying for official release, and even though a variety is released in one country the same process has to be followed elsewhere, despite similar growing conditions that traverse national boundaries (Mgonja et al., 2005). This has led to calls for the harmonization of seed laws and regulations with an objective of creating a regional market large enough to spread marketing risks and promote economies of scale.

2.2 Seed regulatory and policy frameworks in crop -variety development and protection

Numerous national and international policies influence the development and operation of formal and informal seed systems. In many countries the regulatory and legal framework for the national formal seed system limits the development of local seed systems and directly affects women’s position within them.

National seed regulations are usually based on international standards that are often incompatible with the reality of farmers’ lives. They restrict the free exchange and marketing of seed. The combination of compulsory variety registration and seed certification, as practised in countries in Europe and elsewhere, heavily constrains the efficient functioning of the formal seed sector (notably the development of small-scale seed enterprises) and the development of alternative seed systems (GTZ and CGN 2000). The same constraint arises from the implementation of strong intellectual property rights regimes (World Bank 2006) and arrangements restricting access to genetic resources (Louwaars, 2007). One widely recognized problem in many countries is the extended time between the initial identification of new varieties and their eventual release, seed production, and sale, which considerably delays adoption. Different seed certification standards in one country can be used to disallow certain seed classes in another. Finally, non-tariff barriers in the form of phytosanitary controls also limit seed movement, despite the existence of common pests and diseases across countries. Given the complexity of environments and the diversity of crops, there is no “one size fits all” principle in developing one model seed delivery system.

Governments and sub regional organizations such as SADC have to create an enabling policy and regulatory framework to improve the efficiency of the national seed systems and create diverse forms of delivery systems. These systems include the formal, public and private seed sector, and new innovative informal approaches that involve farmer groups (associations, cooperatives), individual seed producers and NGOs operating in a particular country.

Commercial pressure from seed companies and pressure from development investors stimulated collective action for seed trade harmonization in the SADC region to address the above challenges.

As far as the development of improved crop varieties is concerned, there is a general shortage of breeders in the different countries. In many cases, either the breeders are close to retiring or are too young and lacking experience; or there has not been a functional succession plan in many of the governments' civil service. The few breeders available are developing varieties targeting their respective national release systems that are also based on the underlying assumption that varieties are best developed for localized environments. By inference, crop breeders in one country cannot select varieties suited to neighbouring countries. Yet growing evidence highlights the fact that production environments and farmer preferences are not country specific. Very similar environments, farming systems and ethnic groups extend across national borders. New varieties already move across borders among neighbouring farmers despite national regulations. There is also growing evidence of the unexpectedly wide adaptation in many improved varieties. To persuade policy makers that varietal performance was independent of national boundaries, ICRISAT embarked on a detailed analysis of sorghum and millet variety performance data from multiple sites and seasons across the SADC region using innovative statistical techniques that demonstrated that a variety could be effectively evaluated by using relatively fewer test sites (Mgonja et al., 2005 and 2008). These analyses were backed up by the development of maps using geographic information systems (GIS) showing zones of adaptation for specific varieties that cut across several national boundaries. This work was instrumental in changing people's and policymakers' attitudes and most countries moved away from requiring three years of data before a variety could be considered for release, and in some cases even accepted varietal evaluation data from neighbouring countries, but the system was still far from perfect and the other barriers to seed trade still remained.

Development of new improved varieties and their availability to farmers are of crucial importance in the attainment of sustained productivity enhancement. Plant breeders need to be sustainably motivated to develop new varieties. However, a number of breeders in the national public system have not mainstreamed and embraced plant variety protection (PVP) system and are either reluctant to share breeding materials or are not motivated to develop new varieties. An appropriate policy framework and program-

matic interventions are necessary to stimulate varietal development in tune with market trends, scientific –technological advances and suitability for various biotic and abiotic stresses and farmers' needs. Accordingly, an effective *suis generis* system for intellectual property protection is to be instituted to encourage investment in research and development of new varieties and to facilitate growth of the seed industry.

2.3 Gender in Seed Production and Distribution

Traditional breeding approaches tend to focus on characteristics such as higher yields, more stable yields, or disease resistance. Although the results may be impressive with respect to that particular characteristic, farmers, especially women, may not like the accompanying changes in other characteristics such as grain colour, taste, and ease of processing. In this instance, the knowledge and criteria that men and women use in selecting seed and in their other crop improvement efforts offer the opportunity to strengthen links between the informal and the formal seed systems. Sperling and Remington (2006) discuss key steps for ensuring that characteristics demanded by farmers are considered in introducing new varieties. Participatory Variety Selection (PVS) is currently being mainstreamed in final variety evaluation and in some countries; it is being taken as a prerequisite for release. The PVS approach offers the opportunity of having input from men and women farmers in final decision of the variety to be released.

Groundnut seeds are generally considered a female crop



3.0 GRAIN MARKETS ENHANCE WOMEN'S PARTICIPATION IN THE SEED VALUE CHAIN

Local markets are invariably often a crucial link in local seed systems. Local markets bring in grain, which farmers subsequently sort and use for seed. These local "seed-grain markets" differ from formal outlets selling seed that is specially produced as seed, on specialized fields, within the framework of a seed business enterprise. In many African contexts, vendors of local seed and grain are to large extent rural women who are often referred to as "custodians of seed". Farmers are sourcing less seed from their "classic" informal source and depending more on local seed and grain markets (Smale et al., 2007). Gender differences in local seed knowledge and skills are an important asset for strengthening links between the local and formal seed systems.

3.1 Women's role in local markets and small seed enterprises

For resource-poor farmers, especially women, the local seed system is not surprisingly the main and most reliable source of seed (Pionetti 2006; Smale et al., 2007), but medium-scale and better-off farmers also rely on seed from this source (FAO 2008b). An important reason for relying on local seed systems is that small-scale farmers, especially women, often grow a diversity of crops to minimize the risk of total crop failure and food insecurity. Another reason is that women in many societies are in charge of selecting and storing seed of many traditional food crops. Often these crops are valued for specific attributes: they are cheaper, available in small quantities, better adapted to local conditions, and easier to obtain. Local seed systems have been proven to be important in the improvement of seed supply in many developing countries (Almekinders et al., 1994). Moving to the subsequent level in the seed system, women are increasingly participating in the formation and management of small seed enterprises (World Bank, 2005) that deliver better quality seed compared to the informal systems. These more recent experiences need to be monitored and evaluated carefully to better understand their contributions and impacts on improved seed security, wealth creation opportunity for women and overall livelihood security. Applying a gender perspective to analyze and improve seed systems will help to overcome or at least reduce existing biases in access to, availability of, and use of quality seed of improved varieties.

4.0 INTERVENTIONS TO STRENGTHEN THE FORMAL AND INFORMAL SEED SYSTEMS TO ENHANCE ACCESS TO QUALITY SEED OF IMPROVED CULTIVARS AND SUBSEQUENT ADOPTION

Informal, formal and integration of both seed systems will for a long time serve the needs of small-scale farmers in terms of seed. The highlighted challenges along the seed value chain need to be addressed amicably to facilitate both small-scale and commercial farmers' access to quality seed of improved varieties to increase production and productivity. The interventions will be addressed in the context of seed trade harmonization, and through this, discussions will be on the three major areas of regional variety release; regional seed certification and accreditation and science-based quarantine pest lists.

4.1 Regionalized crop improvement and variety registration targeting regional seed market

An efficient and effective seed system is expected to provide sufficient quantity and adequate quality seed of adapted varieties at the right time, at the right place and at an affordable price for farmers. Resources available for agricultural research have fallen sharply in many national agricultural research systems (NARS) and international agricultural research centres. Therefore, it is becoming increasingly important that decision makers focus on improving the efficiency of national and international agricultural research. Breeding and variety release systems have remained largely focused on national challenges, while seed markets are becoming globalized. A synthesis has been provided to give a scientific and economic justification for improving the efficiency of the systems in SADC (Maredia et al., 2004). It further proposes a regionalized breeding strategy that improves the efficiency in utilizing resources for crop breeding. Geographic Information System (GIS) analysis was used to delineate the region into four recommendation domains or agro-ecological zonations (AEZ), based on length of growing period. The AEZ together with multiple variety releases exemplify that constraints cut across national borders and that there is potential adaptability of the varieties across country borders (Fig 1) (Rohrbach et al., 2003; Mgonja et al., 2005 and 2005b). This was also supported by an objective basis for selecting a few potentially useful and representative benchmark test sites for efficient regionalized variety testing in the future without loss of scientific information (Mgonja et al., 2008). The principle behind it is to target regional variety registration through harmonized seed policies as is being fast tracked through the Harmonized Seed Security Project (HaSSP) being led by FANRPAN.

A dedicated mechanism for regionalized release procedures to facilitate farmers' access to new improved varieties will alleviate problems of access to seed by farmers as well as the challenges facing small seed markets.

4.2 Harmonization of seed policies to facilitate Seeds without borders

The need to harmonize seed regulation was recognized and discussed since 1987 (Danagro, 1987). In the early 1980s, the Southern African Development Community (SADC) established a number of regional breeding programs including the SADC/ICRISAT Sorghum and Millet Improvement Program (SMIP), and the SADC/ICRISAT Groundnut Improvement Project with similar initiatives being undertaken by other international agricultural research centres. These projects developed improved germplasm that was supplied to national breeders in the different national agricultural research systems (NARS) who were then free to evaluate and select promising materials for release. Through this process it became apparent that elite materials identified by one NARS were very often the same as those identified by another NARS, which is hardly surprising considering that national boundaries tend not to be defined along agro-ecological lines. The aim of rationalization and harmonization of seed policies, laws, regulations and procedures is to resolve the problem that the seed industry in the region faces with many different standards and regulations in each country, which is far from being cost effective. The ultimate aim of harmonization is to increase the flow of seed across national borders.

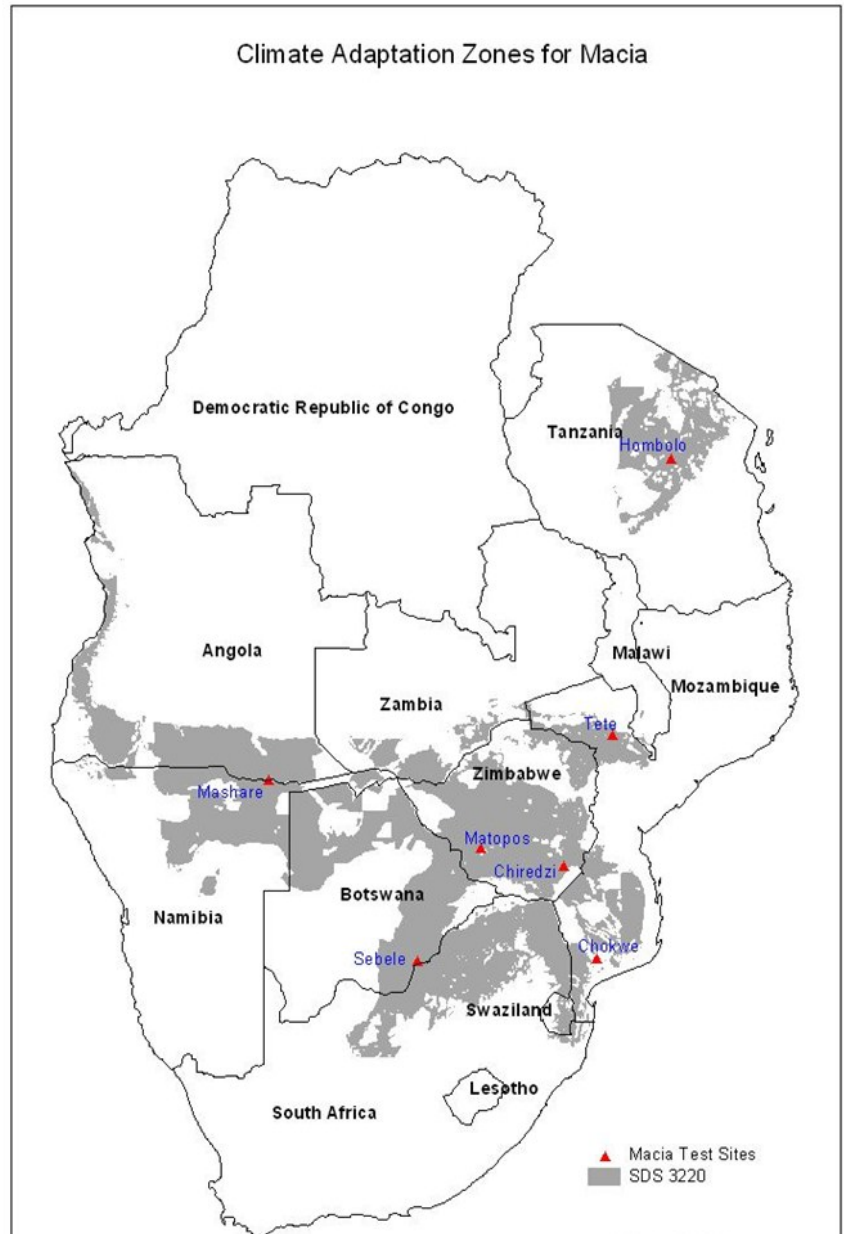


Fig 1: Test sites and adaptation areas of the sorghum variety Macia across Southern Africa region (Mgonja et al., 2005b)

This would increase the choice of quality seed available to farmers, leading to increased productivity, increased income and food security. The three sub regions of sub-Saharan Africa pursued harmonization of seed policies concurrently. The SADC harmonization protocol is at an advanced stage and was approved in 2010 and with funding being made available to pilot its domestication in four countries, namely Malawi, Swaziland, Zambia and Zimbabwe. The three areas of harmonization are 1) SADC Crop Variety Testing, Registration and Release System, (2) SADC Seed Certification and Quality Assurance System, and (3) SADC Quarantine and Phytosanitary measures for Seed. The detailed requirements for the implementation of the three areas for harmonization are provided in the seed protocol and potential challenges have been outlined (Mgonja, 2010 unpublished).

5. RECOMMENDATIONS

Based on the analysis of constraints and knowledge available, it is imperative to propose some recommendations to enhance the efficiency of the seed system with attention and interest on women as natural custodians of seed

- A rigorous participatory priority setting system and tools such as Geographic Information Systems (GIS) need to be deployed in delineating AEZ for addressing biophysical constraints that cut across country borders. This will facilitate Regionalized breeding approaches to address the shortage of human resources and in delivering a regional product/variety –to facilitate “seeds without borders”
- Women participation in Participatory Variety Selection (PVS) should be mainstreamed in the breeding programs to allow breeders to capture the gender differential requirements in varieties considering the end uses. This will enhance acceptance of a particular variety by a wider stakeholder group.
- Farmers like to experiment with new crops and varieties, and innovative distribution strategies could facilitate poor women’s access to improved seed. Packaging seed in small and affordable quantities could be one way of increasing women’s access to seed. It is also important to recognize that seed of improved varieties and hybrids often give the best yields when grown in conjunction with fertilizer and improved crop management strategies. The availability of these additional resources can be a crucial precondition for successful adoption of improved seed, yet many women lack access to cash and irrigated land. Linking women farmers to credit and financial institutions will enhance adoption of productivity improvement technologies and therefore create a wealth opportunity for women.
- In addition to conserving biodiversity, community seed banks through participatory, collective efforts to grow and supply seed can enable farmers to be self-reliant by supporting the timely provision of seed. These need to be initiated and in other cases expanded.
- Community seed fairs have shown positive results, especially for women farmers. Community seed fairs offer a venue for displaying and freely sharing seed of different crops and varieties. Seed fairs also offer a good opportunity for knowledge to be shared across generations, between farmers, between communities, and with research and extension staff, thus contributing to expanding farmers’ social networks. Experiences from a range of organizations indicate that these informal settings encourage women’s participation.
- Development agents supporting small-scale seed enterprise formation need to set aside resources for capacity building on seed production, entrepreneurship and business management and support qualified women to set up small seed enterprises.
- The harmonization of seed policies is currently pursued in a few countries. There is need for the remaining governments, in particular regional blocks, to sign off on the agreed protocol to facilitate domestication of the procedures.
- Where domestication of harmonized seed policies is already being pursued, there is need to establish a monitoring plan that will draw lessons for other countries as they also get into domestication of the protocols.
- As formal and informal seed systems focus on different crop species and varieties and seem to serve different stakeholders, they should be considered complementary. Both systems have strengths and weaknesses on which development interventions can be based. As seen earlier, women farmers are already active in local seed markets and informal seed systems, and they could make important contributions to emerging small-scale seed enterprises.
- The formal seed system can enhance the quality and functioning of the informal seed system by, for example, implementing capacity-building activities addressing both men and women, strengthening community seed banks, and improving seed selection and storage.
- Seed policy should create a framework that enables public and private resources to be used to meet gender-specific demand for seed and that fosters an enabling environment for the synergistic development of the formal and informal seed system. This enabling policy environment will take into account such issues as secure tenure rights for women farmers and improved access to resources, such as inputs or irrigation.
- A regular capacity-building initiative targeted to young breeders for better understanding and domestication of plant variety protection (PVP) systems to motivate and sustain variety development.
- The above recommendations require multi-stakeholder interventions. Formation of a seed system platform that will include actors such as individual farmers and farmers’ groups, especially women farmers; Small seed enterprises; NGOs and development agencies; Researchers and technicians of national and international systems; Policy makers; Public and private seed companies will help in considering and putting into action the above recommendations

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