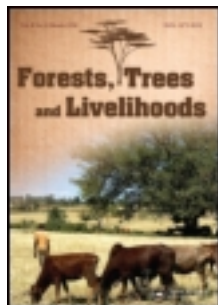


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ALLANBLACKIA, A NEW TREE CROP IN AFRICA FOR THE GLOBAL FOOD INDUSTRY: MARKET DEVELOPMENT, SMALLHOLDER CULTIVATION AND BIODIVERSITY MANAGEMENT

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ABSTRACT

The seeds of *Allanblackia* trees produce edible oil with significant global market potential. Consequently, a private-public partnership involving Unilever and known as 'Novella Africa' is engaged in the development of *Allanblackia* as a new crop in a number of African countries. The purpose of this partnership is to build a profitable and sustainable initiative for harvest, marketing and cultivation. Rural communities are directly involved and a participatory approach to domestication is being followed to maximise farmers' livelihood benefits. This is the first time a multinational company has partnered in such an approach, and the initiative represents an example for the domestication of other new tree crops. Investing in good communication between partners is considered to be essential to success by ensuring trust and a common understanding of priorities. Progress to date has involved the establishment of market supply chains for oil, based

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firstly on wild harvest, and the initiation of cultivation by smallholders. Further work will involve the development of rural resource centres to deliver improved germplasm to growers. At the same time, these centres will provide other services such as market information, credit and access to buyers. Through this strategy it is foreseen that there will be progress towards the development of a market value chain which removes producers' constraints to profitable involvement. Furthermore, the diversification of farmers' cropping systems should have positive impacts for biodiversity and provide resilience in the face of climate change. Currently, the most important activity under the initiative is the promotion of *Allanblackia* planting, so that production constraints do not hamper market development.

Key words: Private-public partnership, Novella Africa, market supply chain, germplasm delivery system

INTRODUCTION

Allanblackia (Clusiaceae) is a genus of nine tree species found in the humid forests of West, Central and East Africa (Table 1). In the last decade it has become the subject of international interest by Unilever and other commercial enterprises as the seeds contain edible oil that can be used in food products. In particular, the oil has significant potential in the global food market as a 'hardstock' for the production of healthy spreads that are low in trans-fats (Ochieng 2007). Unilever estimates that the potential market for oil is more than 100,000 tonnes annually provided that the right quality standards are met. Together, Unilever, the World Agroforestry Centre (ICRAF) and the World Conservation Union (IUCN), along with national research institutions, farming communities, market traders and other parties, have formed a private-public partnership (PPP) known as 'Novella Africa' to develop a sustainable *Allanblackia* oil business (Attipoe *et al.* 2006). Partners involved in market development include Novel Development Companies (known collectively as Novel International) in Ghana, Nigeria and Tanzania, TechnoServe, the Institute of Cultural Affairs (Ghana), The Netherlands Development Organisation (SNV), Faida Market Link (Tanzania) and INADES Formation. Those involved in the promotion of cultivation include Novel International, the forestry research institutes of Ghana, Nigeria and Tanzania, the International Tree Seed Centre (Ghana), the Tanzania Forest Conservation Group and the Amani Nature Reserve (Tanzania).

Already, the oil from two species, *Allanblackia parviflora* A. Chev. and *A. stuhlmannii* Engl., has received the approval of the European Union (EU) Novel Food Regulations that certify safe usage as a foodstuff (Hermann 2009), clearing an important hurdle to high future demand in EU markets. Towards this end, supply chains for *Allanblackia* seed collected from natural stands of the tree¹ have been developed in Ghana, Nigeria and Tanzania, and are under consideration in Cameroon and Liberia (Attipoe *et al.* 2006). Economic projections suggest that, by 2020, around 100,000 farmers could earn an extra income of on average 200 Euros per annum from planting the tree, with greater returns possible in

¹We use the term 'tree' to refer to members of the genus collectively (i.e., whether referring to one or multiple species)

TABLE 1

The known geographic distributions, and conservation status, of nine *Allanblackia* species (based on van Rompaey, 2003). Three species, *A. gabonensis*, *A. stuhlmannii* and *A. ulugurensis*, are considered 'vulnerable' according to IUCN criteria because of restricted distributions and human threats to the forests in which they grow (see www.iucnredlist.org/)

Species	Distribution	Conservation status (IUCN criteria)
<i>A. floribunda</i>	Nigeria to DRC	Not listed
<i>A. gabonensis</i>	Cameroon, Gabon	Vulnerable, habitat loss and degradation (VU A2c)
<i>A. kimbilensis</i>	DRC (Kivu), Uganda	Not listed
<i>A. kisonghi</i>	DRC	Not listed
<i>A. marienii</i>	DRC	Not listed
<i>A. parviflora</i>	Sierra Leone to Ghana	Not listed
<i>A. stanerana</i>	Angola, Cameroon, DRC	Not listed
<i>A. stuhlmannii</i>	Tanzania (Eastern Arc Mountains)	Vulnerable, habitat loss and degradation (VU B1+2c)
<i>A. ulugurensis</i>	Tanzania (Eastern Arc Mountains)	Vulnerable, habitat loss and degradation (VU B1+2c)

later years (Egyir 2007). If current limitations to cultivation are addressed, the foreseen returns from planting will compare well with other perennial crops such as cocoa, oil palm and tea (Shrestha *et al.* 2007). To this end, a planting initiative supported by research led by ICRAF is underway.

Although the potential for *Allanblackia* as a new crop is evident, prior experience in domesticating and commercialising indigenous fruits, nuts and other tree products indicates that promotion must be handled carefully if farmers are to benefit substantially (as we highlight in the following sections; Leakey *et al.* 2005, Marshall *et al.* 2006). Harvest and cultivation of a new crop also has critical implications for biodiversity – for the particular species in question, as well as for other plants and animals – and careful management is required if outcomes are to be positive (Dawson and Jamnadass 2007). Conservation considerations are especially relevant for the regions where *Allanblackia* grows, which are global hotspots of biodiversity and are subject to significant habitat fragmentation (Mittermeier *et al.* 2004). Approaches such as agroforestry – in which a range of trees, annual crops and other plants and animals is combined in productive and sustainable farming systems – have an important role in landscape restoration in these regions (Scherr and McNeely 2008). Trees in farmland are not only important reservoirs of biodiversity in themselves, but also help maintain connectivity between remaining fragments of natural forest (Bhagwat *et al.* 2008). These issues are of particular concern to IUCN and explain their involvement in the current initiative.

In this review, we describe how a coordinated strategy for tree domestication, which incorporates market, cultivation and conservation elements, is being applied to *Allanblackia*. For each element, we review progress and highlight the principle needs for future research and development. In describing the Novella

Africa initiative, we wish to draw together into a common understanding of priorities the diverse partners that are involved in promoting new tree crops. Partners often start with very different perspectives on intervention, but reaching a common position is essential for successful outcomes.

DEVELOPING THE OIL MARKET

Progress to date

Developing market supply chains: Novella Africa began to develop market supply chains for *Allanblackia* oil in 2002. Seed harvesting operations are now underway in three countries – Ghana (based on *A. parviflora*), Nigeria (for *A. floribunda* Oliv.) and Tanzania (for *A. stuhlmannii*) (Attipoe *et al.* 2006; Ochieng 2007), where Novel Development Companies act as buyers. Through verbal presentations, radio broadcasts, posters and video resources, local people are informed about the value of *Allanblackia* and from where and how it can be harvested (SECO 2008). Local associations to mobilise communities are formed and ‘focal persons’ are trained in business skills and record-keeping. Harvesting activities are currently most developed in Tanzania, where 54 collection centres in the Eastern Arc Mountains purchased approximately 450 tonnes of seed in 2008. This seed was harvested by around 6,500 people, a high proportion of them (44%) women (Pye-Smith 2009). Although most seed was harvested from natural forest stands, a proportion came from remnant trees in farmland. These last trees had been retained by farmers during forest clearance because of traditional harvest of seed for cooking oil and soap manufacture (Meshack 2004). In Ghana, where collection activities are next most developed, the amount of *A. parviflora* seed collected by buyers was approximately 100 tonnes in 2008 (SECO 2008).

Village-level extraction of oil from seeds is not considered a viable option for supplying the international food market due to concerns of adulteration. Seeds are therefore transported to central facilities for processing, where oil amounting to about one-third of total seed weight is extracted through crushing (Attipoe *et al.* 2006). Most oil produced by Novel Development Companies to date has been purchased by Unilever for product development; it has not yet been incorporated into commercially available foods (Attipoe *et al.* 2006). Unilever currently provides a guaranteed market for oil set at a premium to other food oils. Their policy is to encourage further buyers that are willing to invest responsibly and sustainably in the initiative into the international market (Grootveld 2009).

Key areas for future action

Value chain analysis: A proper assessment of the constraints faced by local people in participating in the *Allanblackia* oil market is essential, in order that

interventions can be targeted to the key bottlenecks that they face (KIT *et al.* 2006). Such an approach has for example been undertaken to improve farmers' returns from the sale of the kernel of the indigenous njansang tree (*Ricinodendron heudelotii* Pierre) in Cameroon (Facheux *et al.*, 2007). Supporting action in grading seed, strengthening producer groups and providing market information resulted in this instance in farmers receiving a 31% higher price for kernels. TechnoServe adopted a similar approach to remove value-robbing brokerage levels in banana markets in East Africa, with farmers' incomes rising by over 80% as a result (Milder 2008).

Coordinating market developments: Strong organisational structures among growers, consumers and intermediaries are required if farmers are to become 'price makers' rather than 'price takers' (Jordaan *et al.* 2008, Marshall *et al.* 2006). The building of such structures for *Allanblackia* is therefore an important concern. Valuable lessons and support can come from other initiatives to facilitate expanded trade in African natural plant products such as PhytoTrade Africa (see www.phytotradeafrica.com/) and the NaturallyAfrican platform (see www.NaturallyAfricanplatform.org/). In particular, PhytoTrade Africa has wide experience in developing supply chains for a range of indigenous fruits and nuts for food and/or cosmetic use (Lombard and Leakey, this volume).

In the coming few years, it is proposed that National *Allanblackia* Boards are established in order to coordinate relationships between producers and buyers. Boards should seek to diversify market opportunities so that producers are not dependent on individual purchasers. This should contribute to price stability and reduce the possibilities for 'boom and bust' scenarios (if a buyer withdraws from the market) that may otherwise occur. Boards will seek to encourage innovation and protect local peoples' participation, and will share their experiences across countries. Approaches to produce and certify *Allanblackia* oil as fair-traded, organic, and/or sustainably-managed will also be explored, in order to allow access to premium 'niche' markets.

CULTIVATING IN SMALLHOLDERS' FARMS

Progress to date

Early in the initiative it became evident that the potential demand for *Allanblackia* oil was much greater than the supply which could be sourced sustainably from natural stands (van Rompaey 2003). As a result, in 2003 Novella Africa began a programme to bring the genus into cultivation. Until then, very little had been known about the biology of the genus that was relevant to its cultivation, except that trees are mainly dioecious (i.e., separate female and male individuals), grow to 40 m tall, and produce large fruits that contain between 14 and 90 seeds that are difficult to germinate (Mathew *et al.* 2009, Mugasha 1980; Peprah *et al.* 2009, van Rompaey 2003). Work since then has provided the following results.

Seed germination: Under normal nursery conditions, seeds can take more than a year to germinate and success rates lower than 20% are typical (Munjuga *et al.* 2008). Removal of all or part of the testa can enhance germination, while sand, or a mixture of sand and soil, is a more effective medium than soil alone. Treatment of seed with gibberellic acid, an agent that breaks embryonic dormancy in many species, appears to have little effect (Dawson and Jamnadass 2007). Villagers in Tanzania have experimented with a variety of germination approaches, including burying whole fruit for several months before extracting and planting seed. Such 'local research' is providing promising avenues for formal testing of different techniques (Munjuga *et al.* 2008).

Vegetative propagation: Asexual multiplication is possible by rooting of leafy stem cuttings, grafting and air layering (Anegbeh *et al.* 2006; Atangana *et al.* 2006; Atangana and Khasa 2008, Ofori *et al.* 2008). Rooting success of single-node leafy stem cuttings (taken from coppice growing on stumps of mature trees and planted in non-mist propagators) depends on rooting medium, nodal position and the leaf area retained on the cutting. The application of auxin appears to have no effect (Atangana *et al.* 2006, Atangana and Khasa 2008). Under favourable circumstances (setting in sterile sand, retaining some leaf area on cuttings), 70% rooting has been achieved, but only after six months. This slow rooting is associated with a low number of roots per cutting. Ofori *et al.* (2008) report that grafting of seedling rootstocks with scions taken from mature female trees is possible by both side veneer and cleft grafting approaches, with the latter method achieving up to 80% success with *A. parviflora*.

Patterns of molecular genetic variation: DNA studies have described genetic variation across the native range of the genus (Atangana *et al.* 2010, Russell *et al.* 2009). Molecular markers reveal that the evolutionary history of *Allanblackia* is likely to have been complex, as the genetic distances revealed by markers do not always correspond with the geographical distances between species distributions (Russell *et al.* 2009). Molecular markers also indicate that significant genetic variation is present within *A. floribunda* and *A. stuhlmannii*, both of which species are commercially important members of the genus (Atangana *et al.* 2010, Russell *et al.* 2009).

Selection and collection of germplasm: High variation in fruit size and seed yield is evident within natural stands, between populations of the same species, and between species (Fig.1; Dawson and Jamnadass 2007, Peprah *et al.* 2009). Results of research on morphological characteristics are consistent with patterns of molecular genetic diversity (see above) and are in accordance with observations on other African fruit trees. For example, in *Dacryodes edulis* (G. Don) H.J. Lam. (safou) and *Uapaca kirkiana* Muell. Arg. (wild loquat) between two- and ten-fold differences in average fruit size have been observed between trees (Akinifesi *et al.* 2008, Tchoundjeu *et al.* 2008, Waruhiu *et al.* 2004). Potential for genetic improvement through the selection of superior *Allanblackia*

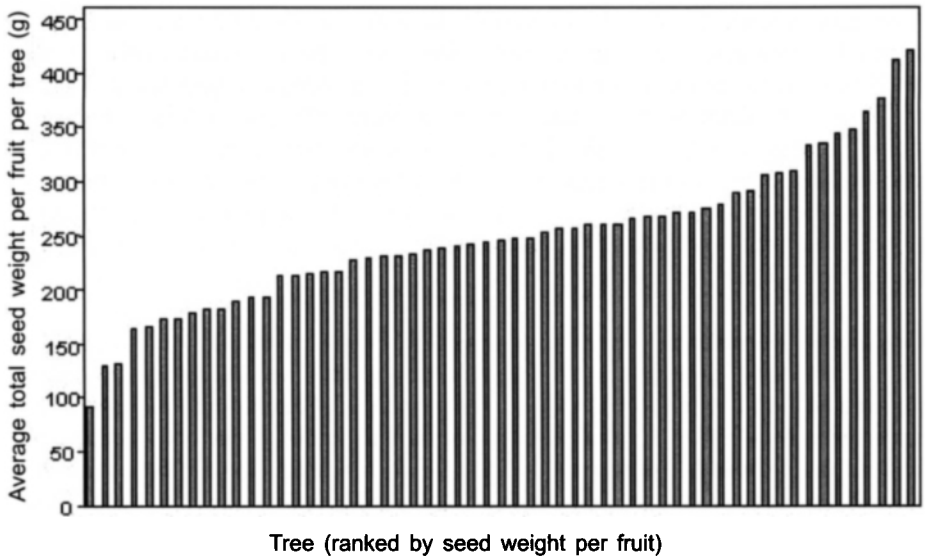


Figure 1. Tree-to-tree variation in average seed weight per fruit for *A. floribunda* trees at a single site, Yalpenda, in Cameroon. Forty fruit were sampled during a single season from each of 57 trees. High variation between trees is evident, which statistical analysis shows to be a significant difference, with average seed weight per fruit ranging from less than 100 g for one tree to more than 400 g for another

genotypes is therefore evident (Peprah *et al.* 2009). A caveat however is that observation of wild stands takes no account of environmental variation, which can lead to overestimation of heritable differences in performance (White *et al.* 2007). Controlled field trials based on seed collected from differently performing wild trees have been established, but data on yield variation will not become available for several years yet.

In the meantime, targeted collection based on fruit size is assumed to be a valid approach for selection and has been adopted in sampling. Seed and vegetative propagules thus collected are being distributed directly to farmers, are being used to plant mother blocks for further (vegetative) propagation, and are being established in 'gene banks' for conservation purposes (Munjuga *et al.* 2008). Approximately 15,000 and 7,000 plants were distributed to Tanzanian and Ghanaian smallholders respectively in 2009 (CK, DO and FR, personal observations). Some farmers are receiving small payments (~10 Euro cents per sapling) to maintain trees over the first two years after planting, in order to see if this affects levels of establishment (Pye-Smith, 2009).

Key areas for future action

Refining propagation methods: Further development of vegetative propagation techniques and the proper training of practitioners in these methods are crucial. This is because clonal propagules carry clear advantages over seed: difficulties

with germination are avoided, female or male trees can be multiplied specifically, and 'elite' genotypes can be captured (Dawson and Jamnadass 2007). Based on studies of other African fruits such as safou and wild loquat (Akinnifesi *et al.* 2008), the capture and vegetative multiplication of ontogenetically mature shoots is also expected to significantly reduce the time between planting and first fruiting. It is estimated that a reduction from around 12 years (propagation from seed) to five years should be possible for *Allanblackia*, but this needs to be confirmed through field trials. Such acceleration in fruiting will allow farmers to receive significantly quicker returns.

Developing germplasm delivery systems: Efficient methods of propagation are a necessary prerequisite to farmers being able to obtain good quality planting material, but they do not guarantee access (Graudal and Lillesø 2007). Experience shows that 'formal' institutions such as national tree seed centres and horticultural research centres are ineffective in reaching smallholders with tree germplasm. This is because of the high costs involved in dealing with widely dispersed clients, each of which requires only a small number of seedlings. Rather, small-scale 'informal' nursery businesses that operate locally and have lower operating costs are much more effective in ensuring delivery (Muriuki 2005). This is especially the case when these nurseries are supported by good quality 'starter' germplasm and training in technical and business skills (Graudal and Lillesø 2007). Encouraging the participation of local commercial nurseries through these measures (Muriuki 2005) is therefore essential in order to scale-up *Allanblackia* planting.

Participatory domestication based on rural resource centres (RRCs) is a successful approach to germplasm delivery practiced by ICRAF in Cameroon for other indigenous fruits and nuts such as njansang, safou and *Irvingia gabonensis* (Aubry-Lecomte ex O'Rorke) Baill. (bush mango) (Tchoundjeu *et al.* 2006; 2008; this volume). This approach needs to be extended to *Allanblackia* in Ghana, Nigeria and Tanzania. Where adopted in Cameroon, RRCs supply germplasm in cooperation with small commercial nursery businesses. RRCs also provide growers with other services, such as training in farm management methods, market information, credit, links with other producers, and connections to traders. RRCs also train farmers to select and collect their own germplasm and bring it into nurseries (Leakey *et al.* 2005). With the lack of formal breeding to date on *Allanblackia*, farmer selection as a method of genetic improvement is an attractive option (Jamnadass *et al.* 2009, Leakey and Akinnifesi 2008). The rights of farmers over the superior germplasm that they select need to be accorded protection, however. The first step in this process is to register varieties under farmers' names at RRCs (Lombard and Leakey, this volume).

Developing farm management methods: Maximising production in farm landscapes requires adoption of the right management techniques. In the absence of complete information, 'best bet' approaches for management should be based on better-researched trees that are related to *Allanblackia* (e.g. *Pentadesma*

leucantha A. Chev., the tallow tree), and/or that have the same fruit size or tree form (e.g. *Durio zibethinus* Murr., the durian, and *Artocarpus altilis* Fosberg, the breadfruit). Naturally regenerating *Allanblackia* individuals establish best under partial shade, suggesting that farmers should plant seedlings under taller crops (SECO, 2008). *Allanblackia* should not be planted at very high density, since mature females are observed to fruit more heavily when in an open rather than closed canopy (perhaps because access for pollinators is easier, or due to increased opportunities for photosynthesis; Cordeiro and Ndangalasi 2007). Propagation method and ontogenetic age during vegetative propagation (which depends on which part of the tree clones are collected from) will determine the size and architecture of *Allanblackia* trees, and research on these relationships is required. By adjusting the propagation method, it should be possible to fit *Allanblackia* into a range of cropping systems.

As only female trees fruit, most trees planted in farmland will be of superior vegetatively propagated female clones. Male *Allanblackia* trees are however essential for pollination and if too few are present productivity will fall. The right ratio (5, 10 or 20 females to one male?) for planting will need to be determined under a range of circumstances. For example, how will this ratio vary according to the distance of farm stands from natural forest containing male trees? The molecular marker tools needed to establish levels of pollen flow from male to female *Allanblackia* trees have already been developed (see above, Atangana *et al.* 2010, Russell *et al.* 2009) and these need to be applied to this question. The issue of pollination is likely to be of even greater importance in the future, as anthropogenic climate change may detrimentally affect the animal vectors needed to carry it out, and so reduce seed yields (FAO 2008).

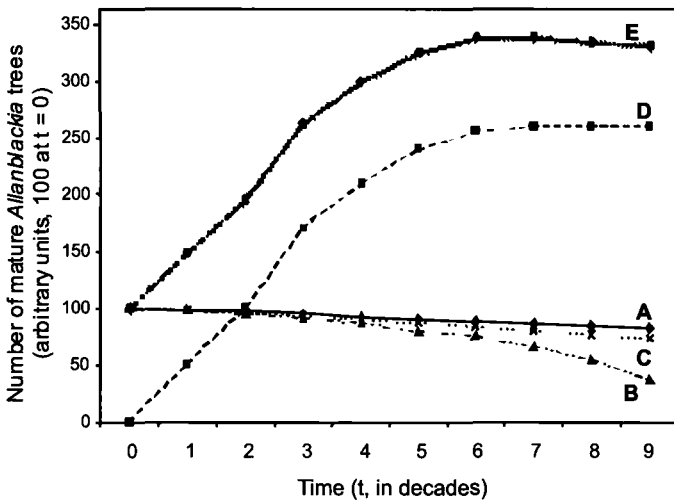
PROMOTING BIODIVERSITY AND SUSTAINABILITY

Progress to date

Rural communities need economic incentives such as the sale of *Allanblackia* seed in order to manage the forests around them more sustainably (Wily 2003). In addition, smallholders require new business opportunities such as that provided by *Allanblackia* planting in order to expand the range of crops that they cultivate, and in order to conserve biodiversity in farmland (Leakey *et al.* 2007). Novella Africa therefore offers positive impacts for biodiversity. At the same time, however, there is the danger that wild harvesting of *Allanblackia* seed may result in over-exploitation of natural forest resources, and there is no guarantee that cultivation will prevent this (Marshall *et al.* 2006). In the following paragraphs, we describe measures taken to understand the impacts of the initiative on biodiversity and to support sustainable harvesting.

Considering scenarios for biodiversity: A review of what is known about the biology of *Allanblackia* has been carried out, and the views of ecologists

have been sought, in order to determine the likely impacts of the initiative on biodiversity (Dawson and Jamnadass 2007). Both the conservation status of the genus itself and impacts on associated plants and animals have been considered. Initially, increased harvesting of seed from wild trees in forest is likely to result in decreased regeneration of natural *Allanblackia* stands. Since harvesting is however not destructive of mature individuals, and because the lifespan of trees is long, the overall impact should be limited: wild regeneration should be possible in later decades when planted stands have taken over the major role in supplying seed (Fig. 2). In fact, the stress on cultivation in the initiative will mean that the total census number of *Allanblackia* trees (wild and planted together) will increase. Planted stands will be an important conservation resource



Key to scenarios

- A, natural trees only, no harvesting, no planting;
- B, natural trees only, with harvesting, no planting;
- C, natural trees only, with harvesting, with planting;
- D, planted trees only, with harvesting;
- E, natural and planted trees combined, with harvesting

Figure 2. The hypothetical impact of different harvesting and planting scenarios for the census number of mature *Allanblackia* trees. Profiles shown are illustrative only; accurate predictions are impossible because of the apparently episodic nature of natural regeneration, the unknown time period over which female *Allanblackia* trees are productive (though this is likely to be several decades), and the unknown intensity of future Novella Africa activities, among other factors. Even without Novella Africa, current trends in forest cover loss in Africa mean that there will be some reduction in the size of wild populations (A). Harvesting of seed from wild trees will eventually lead to a decline in the number of mature individuals in natural stands due to reduced regeneration (B). Planting of trees in farmland (D) will reduce the impact of harvesting in wild stands (C) by providing an alternative resource that will increase the total population size (forest and farmland together) of *Allanblackia* (E)

for *A. stuhlmannii* especially, as this species is both important commercially and is one of three 'vulnerable' members of the genus (Table 1).

Of more concern are the potential impacts of Novella Africa on animals that may depend on *Allanblackia* seed (e.g., the giant rat, *Cricetomys gambianus*, and smaller rodents) and nectar (e.g., pollinating birds and moths) as sources of food (Cordeiro and Ndangalasi 2007, Mathew *et al.* 2009, SECO 2008). In particular, wild harvesting of seed is likely to reduce rodent populations in natural habitats. This may cause a decline in the regeneration of a range of plants that relies on these animals for seed dispersal (Cordeiro and Ndangalasi 2007). Planting *Allanblackia* may result in a shift in foraging behaviour by birds, rats, etc. from forest to farmland (Nyame 2008). This could have positive consequences for biodiversity by facilitating connectivity between populations currently isolated in natural forest fragments (Bhagwat *et al.* 2008). However, the giant rat is considered as a serious pest by farmers because it eats cassava, beans, maize and other staples. The outcome of a shift in foraging behaviour could thus be that the crop production options of farmers are restricted rather than expanded by the initiative (Cordeiro and Ndangalasi 2007, Siaw *et al.* 2004). This needs to be guarded against by monitoring levels of crop predation and by introducing suitable protection measures and/or alternative crops if necessary.

Developing harvesting guidelines: To support the sustainable harvesting of seed from wild trees, guidelines on 'best practice' have been developed by IUCN and partners in Ghana (SECO 2008). These guidelines have been disseminated to collectors and buyers in that nation. Among other measures, harvesters are advised to collect only fallen fruit from trees, and extension services are asked to encourage collectors to plant a proportion of harvested seed in their smallholdings, thereby raising more trees for production. Buyers are recommended to operate only in areas where tenure over trees is undisputed, so that harvesting can be more easily regulated (Amanor *et al.* 2008). These guidelines are under continual refinement as more knowledge on the ecology of *Allanblackia* becomes available through ongoing research (SECO 2008, Mathew *et al.* 2009). Guidelines are in the process of being adopted in Nigeria and Tanzania.

Key areas for future action

Promoting diversification: The opportunity for integration of *Allanblackia* into smallholder cocoa production systems in West and Central Africa is an important one (Asare 2005). Planting in these systems is able to take advantage of ongoing initiatives to improve the sustainability of cacao cultivation (Leakey and Tchoundjeu 2001, Shapiro and Rosenquist 2004). Like Novella Africa, these initiatives involve both the public sector and private companies, and so important lessons for the implementation of PPPs can be derived and shared. Diversification involves using *Allanblackia*, and additional cash crops such as cocoa and other indigenous fruits and nuts, to support infrastructure for market supply chains and germplasm delivery systems. As the Cameroonian model of participatory

domestication (Tchoundjeu and others this volume) shows, this infrastructure – of producer groups, business training, credit provision, local commercial nurseries, rural resource centres, etc. – can then be co-opted for a wider range of trees and other plants. The choice of the other species incorporated into this infrastructure should be based on market demand, farmer interest and the ability to increase productivity by cultivation (Franzel *et al.* 1996). Farm diversification is seen as an important means of providing resilience in the face of climate change (World Bank 2009), and Novella Africa can therefore make an important contribution in this regard.

FINAL CONSIDERATIONS

The commercialisation of indigenous fruits, nuts and other tree products is most likely to be a success when it is demand- rather than supply-driven, and when productivity gains – from which farmers' livelihoods can benefit – are possible though planting (Marshall *et al.* 2006). *Allanblackia* fits this profile well, with high global demand for new food ingredients by Unilever and others, and significant genetic variation in natural stands demonstrating that yield improvements are achievable through cultivation. The process of promotion of *Allanblackia* as a new tree crop, however, has only just begun (see Table 2). Novella Africa has made progress in market development and cultivation, but a step change in the scale of planting in coming years will be required before significant numbers of farmers benefit. At the same time, excessive growth of markets without concomitant cultivation poses a threat that must be guarded against (Leakey *et al.* 2007).

In the worst case, market over-development could result in over-exploitation of natural stands, the cutting of remaining forest for planting, and monoculture establishment, as has been observed for oil palm (Donald 2004). The crucial means by which Novella Africa will ensure against this scenario is through a significant increase in planting of highly productive germplasm by small-scale African farmers. Such smallholders prefer to cultivate a range of crops in order to spread options and to provide other products and services for home use and sale, reducing the risks of monoculture. Furthermore, smallholder also benefit from managing natural forest resources sustainably, and are therefore less likely to clear forest for additional farmland for planting than large growers are (Dawson and Jamnadass 2007). Several hundreds of thousands of trees per annum will have to be planted by smallholders in the coming years.

ICRAF's experiences over the last 15 years demonstrate that finding the right balance between different activities for the promotion of a new tree crop involves the development of a coordinated strategy that includes market, cultivation, and conservation elements (Leakey *et al.* 2003, 2007, Leakey and Akinnifesi 2008, Tchoundjeu *et al.* 2006). Crucially, this involves addressing the different perceptions of the various specialists involved in particular areas of work. For example, 'market delivery' specialists can find it difficult to understand why it

TABLE 2

Areas of action in the Novella Africa initiative. General interventions needed for successful promotion of indigenous tree products such as fruits and nuts are shown, followed by specific progress to date for *Allanblackia*. Key areas for future action are also identified

Element	General interventions for tree products	Progress to date for <i>Allanblackia</i>	Key areas for future action
Market development	<ul style="list-style-type: none"> • Developing demand for a product is crucial • Good organisational structures and relationships in supply chains, among producers, consumers and intermediaries, are essential 	<ul style="list-style-type: none"> • International buyers have agreed to provide a guaranteed market and price for <i>Allanblackia</i> oil, food safety certification to allow access to markets has been obtained • Market supply chains for <i>Allanblackia</i> have been developed in Ghana, Nigeria and Tanzania • Rural communities have begun to collect seed from natural forest and farmland remnants 	<ul style="list-style-type: none"> • Economic returns to local people must be maximised, through prioritising interventions in value chains based on key bottlenecks to their involvement • National <i>Allanblackia</i> Boards that seek to diversify market opportunities and help coordinate trade are required. Boards should include smallholder representatives, to make sure their interests are properly considered
Smallholder production	<ul style="list-style-type: none"> • Assuring ownership (tenure) of planted material is essential • 'Technical' developments – in genetic improvement, in propagation and in farm management – are needed 	<ul style="list-style-type: none"> • Characterisation of the distribution of genetic variation in species and populations has begun • Methods to enhance seed germination and to vegetatively propagate <i>Allanblackia</i> have been devised • Putative high-yielding genotypes that should bring greater returns for farmers have been identified and collected, and are in the process of being multiplied • Smallholders have begun to plant trees 	<ul style="list-style-type: none"> • Refinement of vegetative propagation methods • The development of a germplasm delivery system to reach large numbers of farmers with high-quality planting material is required. Approaches should include the involvement of local commercial nurseries, the establishment of rural resource centres, and encouraging participatory improvement • There is a need to determine and disseminate the best methods for managing trees in farmland, in order to enhance production

Table 2 continues overleaf

Table 2 continued

Element	General interventions for tree products	Progress to date for <i>Allanblackia</i>	Key areas for future action
Biodiversity and sustainability	<ul style="list-style-type: none"> • Participatory forest management (PFM) practices that improve the livelihoods of local people are needed to conserve natural resources • Diverse, profitable agricultural production systems are important for conservation 	<ul style="list-style-type: none"> • Possible scenarios of the Novella Project for biodiversity in natural and farm landscapes have been determined, allowing targeted interventions to enhance diversity • Guidelines for sustainable harvesting of seed that promote PFM have been developed and disseminated • <i>Allanblackia</i> planting is being targeted to diversify smallholder agroforestry systems 	<ul style="list-style-type: none"> • Integration of <i>Allanblackia</i> cultivation with other projects concerned with smallholder diversification (e.g., on sustainable cocoa production in West and Central Africa) is required • The <i>Allanblackia</i> market supply chain needs to be diversified with other products. The seed and seedlings of other trees and crops should be introduced into the germplasm delivery system that supplies <i>Allanblackia</i> planting material to farmers

takes so long to do the research needed to bring a species into cultivation for the first time. At the same time, 'cultivation' specialists operating in the public sector have only limited insights into the commercial pressures of markets, and they prefer to continue their research until 'optimal' rather than 'sufficient' solutions – which would be adequate for the private sector – have been developed for planting and farm management. Furthermore, there is frequently scepticism among 'conservation' specialists about whether private industry is committed to long-term sustainable production.

We have found that the only way to deal with misconceptions is by open and constant communication between partners from different backgrounds (Attipoe *et al.* 2006). This allows consensus to be reached and encourages innovation in reaching new solutions. Although in the case of Novella Africa this has required significant time investments by all partners, we suggest that similar investments are also crucial for the promotion of other new crops. The partners of Novella Africa find it useful to see themselves as parts of a single interdependent value chain that stretches from harvesting, planting and sustainable management through to market delivery to global consumers. For those interested in following the further progress of the initiative, please see the project website for regular updates (www.allanblackia.info/).

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