NICARAGUA

ARAP

Agriculture Reconstruction Assistance Program

DEVELOPMENT PHASE FOR NURSERY AND PLANTATION

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1.0 OBJECTIVES

1.1 Background

In July 2000 the consultant was engaged by Chemonics to investigate the potential to grow cashew in the areas affected by Hurricane Mitch in Nicaragua. The consultant's report **An Evaluation into the Potential of Cashew Nut Production in Areas Affected by Hurricane Mitch in Leon and Chinandega Districts, Nicaragua** concluded that while environmental conditions were suitable, the absence of a suitable domestic cashew gene pool was the single most important obstacle to the development of the industry.

As cashew is a cross pollinated crop, there will be variability between seed, even between seed of the same tree. The only way to ensure the genetic transfer between generations is either (1) in vitro propagation, or (2) vegetative propagation. As 'in vitro' methods are still unproven, the only practical way of transferring of genetic material is by the transfer of scion wood material from host to recipient. While **scion wood** has advantages of ensuring a degree of certainty in genetic transfer, it also has a number of practical disadvantages. These disadvantages are as follows,

- scion wood is highly perishable with a 'self life' of a maximum of about 2/3 days between removal from host tree to grafting on recipient seedling. This makes it very difficult to transfer material long distances, especially between countries.

- as scions are the terminal shots of the cashew tree, the numbers available from any single tree are very limited.

- the care and grafting of scions requires a higher level of skill than propagation by seed.

In contrast the use of **seed** has the following advantages,

- seed is not very perishable, if cared for its' viability can be maintained for many months.

- you can transfer a wide genetic base very easily.

- It does not require as high a level of skills (compared to scions)

The main disadvantage of seed is that it is a slow process to identify varieties as the seed must be germinated, the seedlings grown for several years to establish their performance under the conditions which they will ultimately be grown commercially

In his report of October 2000, **Report on Visit to Project Site (16/17 October 2000)** the consultant made some recommendations including that the highest priority must be 'the establishment of a high class gene pool to allow the future production of high quality cashew trees for commercial production".

1.2 ARAP Proposals

ARAP has taken the decision to assist the development of the cashew industry in Nicaragua by

(a) The importation of cashew seed from Australia to form the basis of the new gene pool in Nicaragua. This will allow the selection of superior varieties in the future, and these new varieties would form the basis of new plantings and encourage the development of the cashew industry.

As part of his visit to Nicaragua (Feb/March 2001), the TOR for the consultant is to (1) supervise the required operations on the ground for the utilization of this seed and (2) to write a manual covering the procedures required for the future guidance of the operatives on the ground.

(b) Establishment of a Nicaragua Cashew Association to encourage cooperation between the parties and development of the industry.

2.0 GENETIC SELECTION PROCEEDURE

2.1 Overall Plan

The overall objective is to select the best cashew trees from the imported seed and then produce large numbers of these clonal (grafted) trees for commercial use in Nicaragua for the longer term. While there will be benefits in the short term, the maximum benefits will only be realized in the medium to longer term (10 years).

ARAP is importing 75 kg (about 10,000) of selected seed in 2001 to form the basis of a new gene pool in Nicaragua. In order to move from an original gene pool to large scale commercial use of superior varieties there are a number of steps that must be followed.

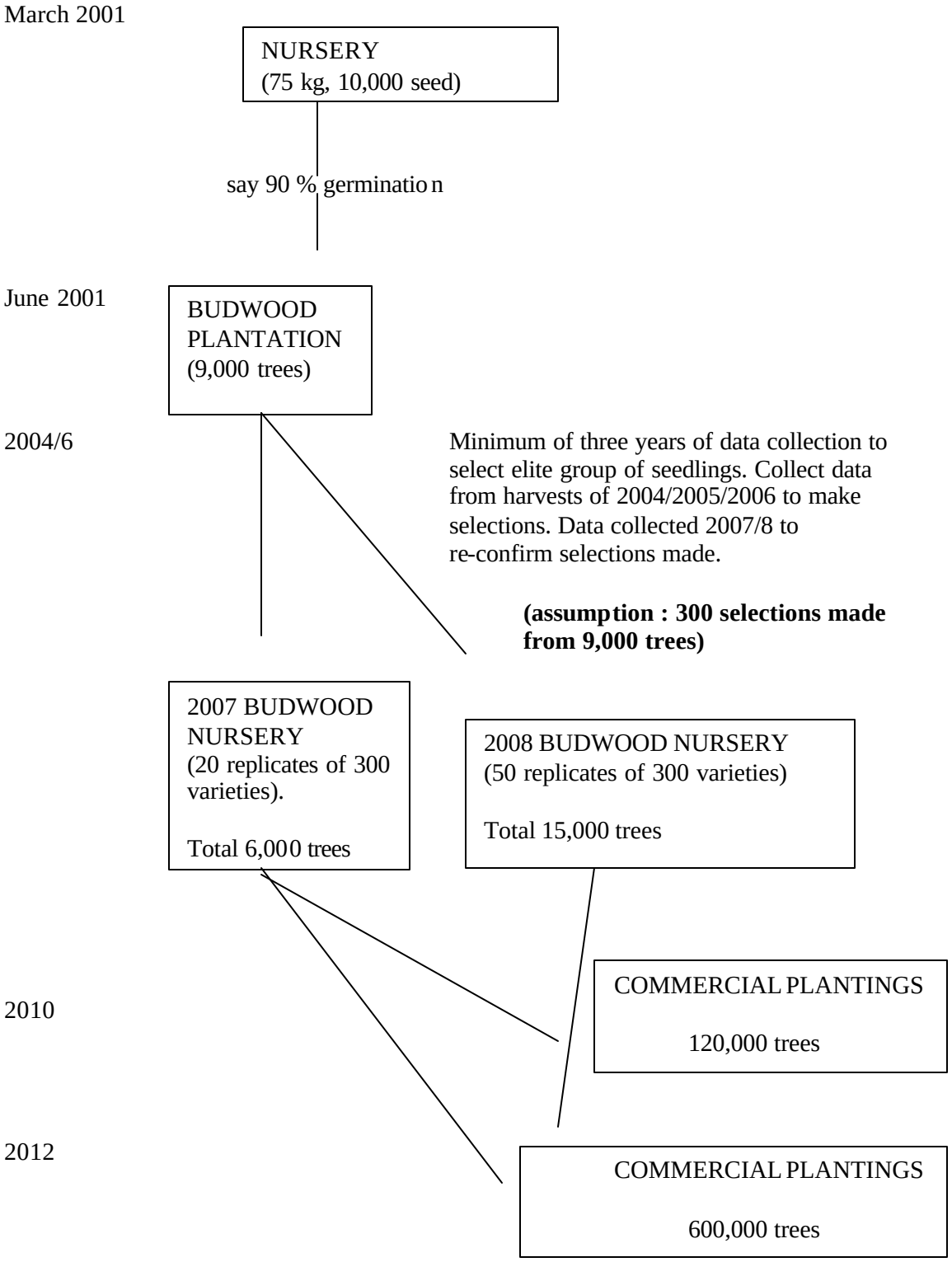
1. All seed must be propagated in a **nursery**

1. Seedling trees are planted in a **budwood plantation** so performance can be monitored and data collected so that best trees can be identified.

2. The selected trees are then reproduced (grafted) and the replicates are then planted in a **budwood nursery**. The budwood nursery is effectively a 'scion wood factory, it only contains replicates of selected mother trees and produce large numbers of scions for grafting.

3. Large numbers of clonal (grafted) trees are produced for commercial use in the **nursery** using the scions obtained from the selected trees in the **budwood nursery**.

Using estimates a possible timetable for development in Nicaragua can be made.



In subsequent years potential commercial tree production can increase exponentially

NOTE – Further imports of similar quality seed would follow the same selection path

2.2 Budwood Plantation

A number of host plantations have been selected by ARAP to be the recipients of the seedlings from the imported seed. These host plantations have two roles,

(1) A **genetic selection** role to grow these new seedlings using a standard conditions of management so that their performance can be evaluated.

(2) (2) apart from the requirements of collection of samples of crop, the host plantation can use utilized by their owners to **earn income** (sell the crop, and inter crop with certain crops for first 3/4 years before the spreading tree canopy inhibits inter-cropping).

(1) Genetic Selection Role

All the seedlings trees planted on the host plantations must be considered as potential new varieties. In identifying the best mother trees for the future, we are looking for only the absolute best, there is no exact target number but a compromise is involved. If the desired level of characteristics in the selection process is set too high, then very few will be selected, and consequently the process to produce replicates for commercial production will ensure a lengthy period before the benefits are realized. On the other hand if the standard is set too low the pace of expansion may be rapid but the selections may contain some poor trees.

A reasonable standard of performance for selection would include the following criteria

kernel size - W320 grade or larger (kernel 1.41 grams and larger).

recovery % - absolute minimum of 30 % (kernel – testa as % of whole nut)

yield total - good total crop in comparison with other trees, no exact figure possible, as yield is significantly effected by management and environment.

consistency bi-annual harvesting effects, important to select trees that show consistent yield. In this case of evaluating young trees, we are looking for a firm increasing yield curve for 3rd, 4th and 5th years.

tree shape - compact canopy and upright growth habit, allows higher density plantings, and consequently higher yields.

cropping - the time of cropping is mainly a genetic characteristic and early bearing trees can have advantages in avoiding harvest during an on-coming wet season, and possibly lower input costs (nutrition, pest control)

Note – more discussion on the genetic selection criteria is shown in section XXX

Given that the seed has come from trees previously selected in regard to the above indicated characteristics, but especially for good nut quality, as follows,

- minimal kernel size – 1.41 gm or W 320 grade
- recovery rate 30 % +

The criteria indicated above are to varying degrees inheritable genetic characteristics, (with nut quality being highly inheritable) then a conservative assumption is that at the very minimum 300 seedlings out of the 9,000 (3 %) will be found to probably exceed the above characteristics, (and probably 500 + seedlings will prove to have a very satisfactory level of performance)

(2) Income generation role

The host plantations are owned and operated by private individuals who can only make the investment if the plantation can be operated to generate income. The requirements for genetic selection should have virtually no impact on the income generating capacity. The volume of crop required for analysis is minimal, and the option remains to grow certain inter-row crops (especially legumes) which can give a return and be beneficial to the cashew. However the inter-cropping should stop well before the canopy of the cashew trees meet between the rows.

2.3 Budwood Nursery

The budwood nursery consists of replicates of the selected varieties, which will be owned and operated by private individuals and will also have dual roles of

(1) genetic selection

(2) income producing role.

In the **genetic selection** role the trees are grown for their capacity to produce scions for the large scale production of grafted trees for commercial plantings. As the scions are in effect the early crops producing terminal shoots, then the removal of a significant number of scions from a tree largely precludes the achievement of crop for that year. However the period of scion producing would be limited (perhaps 2/3 years), and thereafter when the tree's scion producing role is over it reverts to **income producing** as in a commercial plantation.

3.0 CONCLUSION

The following 'Growers Manual' has been written with the objective of assisting local farmers grow cashew. It is aimed at the audience who currently on average have little information on cashew and on the other hand (most of whom) are clearly interested to grow cashew with the maximum level of technology consistent with their resources.

Therefore this manual seeks (1) to combine sufficient (but not too technical) information about cashew that is at the level that should be useful to local growers and (2) details on the technical inputs required to produce at the highest levels as gained from Australian experience. This manual was produced in limited time and should be seen as the 'first edition' only. It can be improved significantly later by adding diagrams and especially photos to improve the descriptive power of the document.