A brief study report:

Standard procedure for the introduction of New Carrot Seed varieties

In Ethiopia

by: Megbaru Ayalew

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1. Background

Carrot Aid team in Copenhagen have closely been working with Ethiopian Institute of Agriculture Research Center and DCA - Ethiopia office with the objective of improving communities' eye related health and tackle the prevalence of night blindness through support and provision of varieties of Carrot seed plantation and production of an improved varieties of Carrot for consumption.

In the follow up, for the better support, Carrot Aid requires a clear understanding on the National guidelines and procedures how new and improved varieties of Carrot seeds, considering the experience of Haramaya University, can be recognised, registered and released for an official and widespread use among farm communities in the Ethiopia.

Ethiopian Institute of Agriculture Research Center in collaboration with, and financial support of, Carrot Aid have been researching and working on the development of new variety of Carrot Seed aiming to have an improved variety both in its nutritional value and marketability for wider distribution of seeds for plantation and enhanced consumption habit of households.

The work in progress variety, DZRC-5, have gone through different step forward levels: Field level plantation trials on its growth, productivity, marketability and farmers preference looks bearing fruits along with the intended objectives among researchers, farmers and contributors. Hence, for a further planning and action, understanding the national procedure for an official introduction of new seeds and learning the experience of Haramaya developed variety AUA – 108 and its distribution to the local farmers may help efficiently and widely to reach the local individual farms with the newly developing DZRC- 5 variety of Carrot seed.

Consequently, this brief study is prepared with the objective of describing the standard procedure available on an introduction of newly released seed varieties and experience of Haramaya University.

2. National standard procedures for a release of new variety of Seed

Is there a national standard procedure for the approval and registration of new variety of Seeds in the country? The answer for this question is affirmative. Understanding the well sated procedure and guidelines, promotes the effort of the carrot aid team and other interested for a timely introduction and promotion of carrot seed varies, plantation, and wider distribution of an improved quality type to reach to defined objectives.

2.1. Responsible offices and the structures

According to the country's law, The Plant Variety Release , Protection and Seed Quality Control Directorate within the Ministry of Agriculture and Natural Resources is a responsible organ in coordinating all duties related to the evaluation, assessment and provision of comprehensive status information of varieties of seeds to breeders/ researchers, institutions and beneficiaries.

Recently, the office has taken an initiative to develop an annual register book for new variety seeds introduced during the year 2015 and before the year 2015 for an official recognition of seeds in nine categories. Such as; **Cereal Crops** (366 varieties), **Pules Crops** (199 varieties), **Oil Crops** (97 varieties), **Tubers, Roots, and Vegetable Crops** (207 varieties in which Carrot has got only two varieties registered), **Condiments and Medical Plants** (40 varieties), **Fruit Crops** (41 varieties), **Forage and Pasture** (33 varieties), **Fiber Crops** (30 varieties), and **Stimulants Crops** (36 varieties). Totally so far 1049 newly released varieties of seed have been registered in different kinds of crop types. This can be taken seriously that an official seed approval procedure is functioning well.

Hence, according to the stipulated variety release guidelines:

A researcher or an institution or Seed breeder after having done all scientific/ experiment processes and trial requirements can submit an application proposal, any time to the Plant Variety, Protection and Seed Quality Control Directorate within the ministry of Agriculture and Natural Resources office.

A proposal or an application documents in triple copy should summarize the background and performance trials of the particular seed at least along with two to three years results.

The application or the proposal document for a release of a new variety seed should also include the following features:

- Background: Information on source, origin or breeding history and information about the proposing institution;
- Performance trial; summary of key features, data of production and productivity, anticipated usefulness, and / or disclosure of limitation, or unknown features. Including details on yield data, quality, socioeconomic analysis, resistance and region of adaptation and recommended production packages specifically for a seed type.
- Seed production and Availability: type and quantity of seed available for distribution and finally,
- Ownership: details of major contributors for varietal development..etc the sample application/ proposal format – annex – 2

2.2. Duties and responsibilities of participants

In the formal structure of the Ministry of Agriculture and Natural Resources, the role of seed breeder as an applicant, the technical committee and the national variety release committee have been explicitly stated. Moreover, role of the Extension system including the development agents, farmers' associations, unions, farmers training centers, NGOs and other contributors are also implicated.

2.2.1 **Applicant (Private individual, Research institution, Universities etc.)**

Applicants are those who have the capacity and interest to introduce new and improved varieties compared to the existing seeds. Having proper documentation and data of experiment results that can meet standards spelled on the application document can submit an application to the technical committee any time in a calendar year.

2.2.2 **Technical committee**

Technical committee is established under the leadership of Plant release , protection and seed quality directorate composed of three to four different professionals such as pathologist, agronomist, extensionist and as required laboratory specialists that can be from other institutions, within ministry of agriculture including an applicant.

Therefore, variety proposed for release or registration should pass through various verification trials at least for one season on one trial station and on two farmers' field at different locations.

The technical committee has an overall responsibility to evaluate, verify application document, and conducts a field level observations.

Further, Validates data presented in the application document through an intensive field level evaluation on trial stations, on farmers' land performance as well conducts an interview and propping to assess and measure the level of individuals farmers satisfaction.

Finally, the technical committee prepares an evaluation report that covers performance data evaluation, field performance evaluation, general comments and recommendation, to NVRC.

The technical committee recommendation usually holds a clearly specified rating. Such as, the type of seed in the application is rated to be released as a new variety or provisional for register when it for adaptation, or the seed in the application should be repeated or the last rating is rejection.

2.2.3 **National Variety Release Committee (NVRC)**

NVRC is the higher body that gives the final decision based on an evaluation report of the technical committee. NVRC is also called standing committee.

The NVRC holds at least two meetings; one for rain fed crops and one for irrigated crop varieties. The applicant or breeder and representative of the major contributing institution attend the meeting on nonvoting status as provider of information on the variety of seed under discussion. In addition, the team leader of the technical committee presents the evaluation report.

The standing committee makes decision on a formal voting procedure. Upon decision for release of a variety, a variety's description and recommendations for wider production are published in the national crop variety register. Accordingly, the NVRC writes a congratulation letter to the applicant for the recognition of efforts and results achieved.

Further, upon the release of a new variety, the breeder/ team of applicants are required to make a permanent variety denomination. The name should preferably a short local name for ease to users. Variety registered through adaptation trials must retain the original name to avoid confusion and to comply with intellectual property rights.

Finally, as part of the release procedure, the applicant is expected to have a pre- release multiplication of seed as well as maintaining a minimum quantity of breeder's seed is a prerequisite for release. That is breeder's nucleus seed, usually not less than 10 kg has to be retained in a cold storage. Variety maintenance and breeder's seed production remains the responsibility of the breeder as long as the open pollination variety is under commercial production.

The committee is composed of nine representatives from different and relevant institutions, and the committee has Chairperson and secretary. Ministry of Agriculture and Natural Resources is secretary.

NVRC member institutions:

a, Haramaya University

b, Debrezeit Agriclure Reaserch institute

c, Tigray Agricluture Institute

d, South Agriclure institute

e, Hawasa University

f, Melkasa Agriclural reaserch Center

g, Oromia Agriclutural center

h, Amhara Regional Agriclutural research Center

I, Ministry of Agriculture and Natural Resources

3. Post approval/ release of new variety of Seed

As described above, the approval procedure is succinct that any seed breeder should follow , however; there are activities that remain salient post release of a new varies of seed which determines success and sustainability of new variety seed during planation, harvest, marketing and consumption. These activities should also be accomplished with an effective coordination and collaboration of various actors - like formal institutions(MoANR, Regional Agriculture and Natural Resources, government managed Seed Enterprises, Extension system, Woreda Development Council, Development Agents, Farmers Training centers) Farmers' associations/ unions, individual farmers, private seed traders and non –government organisations and other contributors(Health Offices, Nutrition study institutions and Laboratories, Schools etc) , for a wider distribution and complete acknowledgment of variety from both demand and supply side.

Creative use of these institutions by area specific, character and nature of the socio economic situation of farmers' communities and climatic factors depends on detail implementation strategy and capacity of the seed breeds. Therefore, highlighting the role of each of involving elements along with salient activities is important for detail planning and committed implementation.

3.1 Matrix of activities and role of institutions/ actors:

No.	Activities	Detail activities/ strategies	Responsible
I	Seed production	From the outset the seed breeder has to engage in mass quantity seed production and storage that could be available for distribution to volunteer farmers associations ,	Seed Breeder Volunteer farmers and associations

		individual farmers and the extension system	
Ii	Popularisation	The breeder has to design different mechanisms(Newspapers, community radios, posters etc to make a seed variety known among farmers, development agents, along with the extension system and at large to the consumers	Seed Breeder: along with the formal institutions , Private traders and NGOs
Iii	Organising Farmers field day	Reaching and convincing farmers - possible on a practical training at field level with vivid observations on advantages of the specific variety. Production(size , color shape) and Consumption: sweetness, tenderness and its nutritional values involving health workers	Seed Breeder in collaboration with Extension workers, development Agents, woreda development council, schools, Health posts.
Iv	Demonstration	Farm technics, disease control, seed application, watering technicians and timing, etc.	Seed breeder in collaboration with the formal extension system
V	Publishing	Photos, posters, brief pamphlets,	Seed Breeder , Non-government organisations
Vi	Follow up and monitoring	Supportive supervision at all stage of trials	Seed breeder, MoANR
Vii	Training on Nutritional values	Focused training on the nutritional value of carrot at school , health posts and to farmers community and specially focused on women's gatherings	Collaborate with health offices at woreda and Health extension worker at kebele level and Non-government organisations, and Contributors
Viii	Support of quality maintenance	Regular and continues check up on the nature of	Seed breeder and the Extension system

		the need seed planation and productivity.	
Ix	Winning farmers choice	Periodical survey on Farmers opinion, preference and satisfaction.	Seed breeder, non government organisations

4. Experience of Haramaya University on new variety of Carrot (AUA – 108)

Haramaya University researchers worked on development of new variety of Carrot Seed with the following objectives:

- To develop carrot variety with high carotene, a precursor of Vitamin A, so carrots provide more nutrition per unit of mass
- To develop carrot variety with appealing physical parameters(long , slender, smooth) for marketing
- To develop Carrot variety that can produce Seeds locally
- To improve and optimize agronomic practices for root and seed production such as seed bed for optimum carrot growth and amount of fertilizer needed.

For that reason, the university has successfully worked out a new variety of seed called Haramaya 1 (AUA- 108).

How long it took to finalize the release of the variety?

The university recognises the period taken to develop the new variety of Carrot seed into two categories: The first one, the research time: this period took about six years. The period is relatively longer than the usual mainly due to administrative and technical reasons.

The administrative reasons are: The University had assigned a researcher at a time; however, there had been number of turnovers of researchers. Not less than three researches one at a time have worked on. Mainly researchers leave the university for further studies outside of the country , consequently that have caused to take unplanned time to do the proper handover to a newly assigned one, and budget constraint to follow up at full capacity have had pressure on the research schedule.

The technical reasons are mainly related to the actual research works and processes which are aimed to meet standards:

Such as, three site trial at different locations in a rain feed areas minimum for two years, Nursery Trial minimum for One year, observation for minimum of one year and Seed trial conducted on 100 varieties of community seed, Seed collection itself has taken considerable time, which in process settled down into 10 varieties for a focused scientific works have taken significant time. All have had their own detailed constraints that led to extended period of time.

In addition, the University had no enough plot of land for seed and Nursery trials that meet the standard requirement hence, had to look for voluntary farmers through arrangements - like provision of free supply of seed, close supportive agronomic practices and trainings. Further Voluntary farmers had no enough plot of land at one site. That has taken considerable effort and time to work out the necessary arrangements. Moreover, being there are different community owned carrot varieties out there in the field, it was difficult for a controlled trial as Cross pollination repeatedly had been contaminating the controlled trial. So there were needs for an extra effort to do a repeated trial to get hold of none contaminated and an improved variety.

To sum up, the researchers turnover, financial constraints, the lengthy requirement to meet regional and national standards, shortage of isolated but enough plot of land for controlled trial for both Nursery and yield trial free from contamination of variety due to cross pollination effect, seasonal rain shortage and lack of irrigation facilitates, and the experiment process on number of varieties to settle into the final point are the main reasons for the extended period of time taken.

The total task, according to Professor Kebede of Haramaya University, has incurred not less than Ethiopian Birr 60, 000 which is currently equivalent to USD 3,000.

The second category of time was: Time for release. As mentioned above, to go through the national procedure from submission of proposal for the release to the document and field level verification for ensuing the final release has take two years which demanded Ethiopian birr 25,000(USD 1,250).

Currently, the university is working on further to multiply more seed, and recruiting lead farmers as models to disseminate the seed. Despite the all good attempts, this year the seed harvest was highly discouraged due to harsh cold weather.

The university, knowing the growing demand for this particular seed, being farmers planted carrots are on local market and potentially demanded for exports like to Somalia, Djibouti and

Yemen, has got a strategy further to introduce small scale irrigations, supportive supervision to individual farmers and farmers' associations, unions and seed management package that includes standardized agronomic practices and pesticides management are on progress.

Further, the university has now a dedicated researcher that continues working on carrot variety development.

The university opts to cooperate and work with NGOs on different crops and vegetables seed improvements. For example: an NGO called Fair Planet, an Israel based, is cooperating and working on Tomato seed improvisation, pilot farmers training and demonstration in cooperation with the university.

Similarly, the university has an ambition to cooperate and establish a relationship with Carrot Aid team for further technical and financial support both on how to widely disseminate the AUA- 108 Carrot seed nationally and other related activities.

Therefore professor Kebede and Dr. Teodros have agreed that Dr. Wassu Mohammed to be a focal person for further communication with the Carrot Aid team.

Their contact address: Prof. Kebede: telephone +251 915 32 10 47

Dr. Teodros: telephone +251 911 34 60 71

Dr. Wassu Mohammed : telephone + 251 915 73 78 42

Email: wasmoha@yahoo.com

Moreover, the need for more improved carrot variety both from consumption and economic benefit of farmers in the country has been clearly discussed with the university, and according MoANR; Plant Variety Release, Protection and Seed Quality Control Directorate yearly Crop variety register, Issue No. 18, there are only two carrot varieties officially released and registered in the country. One of them is variety SAMSON, Year of release 2011; Breeder/ maintainer by the name Bejo seed B.V. Crop grow plc, and the second is variety Haramaya 1 (AUA – 108), Year of release 2014; Breeder/ maintainer : Haramaya University.

Generally, the variety is under production; however, the extent of its field coverage and degree of preference among farmers compared to other varieties it not yet evaluated further.

In Ethiopia, annually, about 3,697.26 hectares of land covered by carrot planation; in the calendar year 2014/ 15 the total production of carrot estimate was 14,297 ton that is for 100 million total populations.

Haramaya Univerisity, as a breeder, is closely working with farmers within the vicinity of the University through provision of seed and supportive supervision, along with lead Farmers, Agriculture extension works and development agents in East Hararge. Activities on mass production of seeds both in farmers land and controlled trial station are ongoing though bad weather impacted on the level of achievements.

Numbers of Field level demonstration have been conducted at different location. Farmers training and familiarisation as a plan will continue further to win farmers' choice for the improved variety.

Demonstrations of the variety to farmers' representative in major carrot growing areas, and working with extension development agents to identify active individual farmers for extended training and orientation are focused strategies.

5. The DZARC-5 Variety:

The DZARC- 5 variety of carrot seed which is under progress with the support of carrot Aid team, in the hand of Debrezeit institute of Agriculture Institute, has already got a great potential for its specific features as described by seed researchers. The variety is good at total B- carotene, sweetness, and tenderness.

Moreover, comparable to that of Nantes and AUA -108, DZARC – 5 has got good record of total production results, and generously produces seed under mid and high altitude in the country. But marketability of Carrot in terms of its smoothness and physical quality or shape is lower than the vars available.

However, following up on expected standards and learning new variety release procedures, Debrezeit research center may require focused detail action plan to review the work in progress against the requirements stated on the standard application proposal for a variety release request.

6. Conclusion

Haramaya University is successful in acquiring the official release of the seed variety, however; the extent of seeds distribution, planation, demand for the type of seed, carrot in the market, and the degree of consumers' behaviour change in an incremental effect on

carrot consumption among communities in the carrot growing area may need further study.

Apart from production, familiarizing and popularising carrot consumption efforts emphasizing on its nutritional values related to Vitamin A and its contribution in tackling Eye blindness may have a significant impact from two important directions: One from wider distribution of seeds, and from promoting demand for carrot consumption. In effect, it encourages farmers to plant more, to sale more and to consume more.

Further, being requirements and procedures are ready clear, the Debrezit Institute of Agriculture research has to preceded to the next step forward: Documentation of results achieved so far and preparation of a proposal document for an official application.

Annex…….

I. Application format for Variety release/ registration

II. Questionnaires

III. List of contacted people

1, Dr. Getachew Tabor Senior researcher at Debrezite Reasearch Insitute

2, Dr. Mesfin melaku Senior Expert At MoANR; Plant Variety Release and Protection

3, Dr. Daniel Mekonen Directorate Director At MoANR; Plant Variety Release and Protection

4, Dr. Medemidemia Team leader At MoANR; Plant Variety Release and Protection

5, Mr. Tekelemariam Mengistu Independent; former seed enterprise head,

6, Professor Kebede Haramaya University

7, Dr. Teodros Haramaya university