

PROCEEDINGS OF THE FSN FORUM DISCUSSION No.33
**IMPACT OF CASSAVA DEVELOPMENT ON FOOD SECURITY
AND NUTRITION OF THE RURAL POOR**
FROM 15 APRIL TO 15 MAY 2009

Summary available at:

http://km.fao.org/fileadmin/user_upload/fsn/docs/SUMMARY_ImpactOfCassavaDevelopmentOnFSNofRuralPoor.doc

TABLE OF CONTENTS

| | | |
|------|--|----|
| I. | GENERAL INFORMATION | 1 |
| II. | INTRODUCTION OF THE TOPIC..... | 2 |
| III. | LIST OF CONTRIBUTIONS | 4 |
| | Contribution by Juliane Friedrich from World Vision Deutschland, Germany | 4 |
| | Contribution by Judy McLean from University of British Columbia, Canada | 5 |
| | Contribution by Judy McLean from University of British Columbia, Canada | 6 |
| | Contribution by Edward Mutandwa from Rwanda Development Agency Rwanda..... | 7 |
| | Contribution by Purna Chandra Wasti from Department of Food Technology and Quality Control Nepal | 7 |
| | Contribution by Martin Fregene from Donald Danforth Plant Science Center, USA | 8 |
| | Contribution by Chikelu Mba from Joint FAO/IAEA Agriculture and Biotechnology Laboratory, International Atomic Energy Agency, Austria..... | 9 |
| | Contribution by Judy A. McLean from University of British Columbia, Canada..... | 10 |
| | Contribution by Michael Carbon, from the International Fund for Agricultural Development (IFAD), Italy | 11 |
| | Contribution by Louis Djilemo from GIC CAIC, Cameroon | 11 |
| | Contribution by Martin Fregene from Donald Danforth Plant Science Center, USA | 13 |
| | Contribution by Louis Djilemo from GIC CAIC, Cameroon | 14 |

I. GENERAL INFORMATION

| | |
|--------------------------|--------------------------|
| Duration: | 15.04.2009 to 15.05.2009 |
| Number of participants: | 7 |
| Number of Contributions: | 12 |

II. INTRODUCTION OF THE TOPIC

English version (scroll down to read the message in French)

Dear FSN- colleagues,

My name is Michael Carbon. I have been working as an evaluation officer for the Office of Evaluation (OE) of the International Fund for Agricultural Development (IFAD). OE evaluates IFAD's projects and programmes to assess what works and what doesn't and to determine how far IFAD's policies and strategies are successful in tackling poverty alleviation in rural areas.

The Benin Roots and Tubers Development Programme (PDRT), co-financed by IFAD and the West African Development Bank (WADB) is currently being evaluated by our office. This national programme, implemented from 2001 to 2008, has focused mainly on cassava, supporting the development of sustainable input supply (seeding material in particular), production, processing and marketing of cassava products in Benin.

In this context, as the IFAD Lead Evaluator for this evaluation, I would like to know about your experiences regarding **development projects and programmes that focus on a single staple crop such as cassava.**

Your experiences and insights related to the following points could greatly help our current evaluation:

1. Impact of projects and programmes focussing on one staple crop:

- What impact on income and food security of the rural poor has been demonstrated? Who gained and who lost?
- Are there any studies on the nutrition value of roots and tubers, and cassava in particular? What would the impact be on the nutrition status of the population when there is a gradual shift from a maize and bean based diet towards a cassava based diet?
- What impact on the environment (soils, forest, water resources, wildlife etc.) can be observed when cassava becomes more important in the farming system? How could negative environmental impact be mitigated?

2. Lessons learnt

- In general, what can we learn from projects and programmes focussing on one single commodity, in particular those focussed on cassava?
- What approaches were (or could be) used to target the benefits of this type of projects to the poorest and most food insecure population groups?

Your inputs will help us to place our evaluation in a broader context and focus on items for learning that are of particular interest to the development community.

More information on the project and on the Office of Evaluation of IFAD can be found on the IFAD website following those links:

<http://operations.ifad.org/web/ifad/operations/country/project/tags/benin/1127/project%20overview>
<http://www.ifad.org/evaluation/index.htm>

The evaluation report will be prepared over the summer and shared with the forum for comments.

Many thanks to all and I look forward to your rich contributions,

Best regards,

Michael
Evaluation Officer
Office of Evaluation
International Fund for Agricultural Development (IFAD)
www.ifad.org/evaluation/index.htm

Carbon

French version

Chers collègues,

Mon nom est Michael Carbon. Je travaille comme Chargé d'évaluation au Bureau de l'évaluation (OE) du Fonds international de développement agricole (FIDA). OE évalue les projets et programmes co-financés par le FIDA pour évaluer ce qui fonctionne et ce qui ne fonctionne pas et pour déterminer dans quelle mesure les politiques et stratégies du FIDA contribuent à la lutte contre la pauvreté dans les zones rurales.

Le Programme de développement des racines et tubercules (PDRT) au Bénin, co-financé par le FIDA et la Banque Ouest Africaine de Développement (BOAD) est actuellement évalué par notre bureau. Ce programme national, exécuté de 2001 à 2008, a porté essentiellement sur le soutien au développement durable de l'approvisionnement en intrants (boutures en particulier), la production, la transformation et la commercialisation des produits du manioc au Bénin.

Dans ce contexte, en tant que chargé de cette évaluation, je voudrais connaître vos expériences concernant les **projets et programmes qui se concentrent sur le développement sur une seule culture vivrière telle que le manioc.**

Votre expérience et connaissances relatives aux points suivants pourraient grandement contribuer à notre évaluation en cours :

1. Impact des projets et des programmes mettant l'accent sur une seule culture vivrière (manioc en particulier)

- Quel impact sur les revenus et la sécurité alimentaire des ruraux pauvres a été démontré ? Qui a gagné et qui a perdu ?
- Y a-t-il des études sur la valeur nutritive des racines et de tubercules, et du manioc en particulier? Quel serait l'impact sur l'état nutritionnel de la population quand il y a un passage progressif d'un régime alimentaire basé sur le maïs ou le sorgho et de haricots, vers un régime alimentaire à base de manioc ?
- Quel impact sur l'environnement (sols, forêts, ressources en eau, la faune etc) peut être observé lorsque le manioc devient de plus en plus important dans le système de production agricole ? Comment l'éventuel impact négatif sur l'environnement peut-il être atténué ?

2. Leçons apprises

- En général, que peuvent nous apprendre les projets et programmes axés sur une seule culture vivrière, en particulier ceux axés sur le manioc?
- Quelles approches ont été (ou pourraient être) utilisés pour cibler les bénéficiaires de ce type de projets pour les plus pauvres et plus vulnérables sur le plan alimentaire ?

Vos contributions nous aideront à placer l'évaluation dans un contexte plus large et de concentrer nos efforts sur les points d'apprentissage qui sont d'un intérêt particulier pour la communauté du développement.

Plus d'informations sur le projet et sur le Bureau de l'évaluation du FIDA, peuvent être trouvés sur le site Internet du FIDA les liens suivants:

<http://operations.ifad.org/web/ifad/operations/country/project/tags/benin/1127/project%20overview>
<http://www.ifad.org/evaluation/index.htm>

Le rapport d'évaluation sera établi au cours de l'été et partagé avec les membres du forum pour commentaires.

Un grand merci à tous et je me réjouis de lire vos riches contributions,

Cordialement,

Michael Carbon Chargé d'évaluation
Bureau de l'évaluation
Fonds international de développement agricole (FIDA)
www.ifad.org/evaluation/index.htm

III. LIST OF CONTRIBUTIONS

Contribution by Juliane Friedrich from World Vision Deutschland, Germany

Dear Michael,

From the nutritional point of view, shifting from a maize/beans based diet to a cassava diet is definitively not advisable. Cassava is lacking protein and provides mainly carbohydrates. This is of particular importance for children in need of nutrient dense and not only nutrient-rich diets. However, cassava remains an important staple food for adults as it provides good amounts of energy. The promotion of cassava leaves makes sense even for children's diets as in addition to carbohydrates you find proteins as well as Vit. A. There are a number of studies available - here FAO will be a good source.

Kind regards

Juliane

Juliane Friedrich
Nutritionist, PO Food Security
World Vision Deutschland e.V.

Contribution by Judy McLean from University of British Columbia, Canada

I am responding to the topic and particularly these questions:

- What impact on income and food security of the rural poor has been demonstrated? Who gained and who lost?
- Are there any studies on the nutrition value of roots and tubers, and cassava in particular? What would the impact be on the nutrition status of the population when there is a gradual shift from a maize and bean based diet towards a cassava based diet?

The **nutritional quality of a cassava based diet vs a grain based diet** is of great concern to nutritional scientists working in food security as tuberous roots are only 1-2% protein compared with grains which are ~ 8-12% protein. Even though the latter are not considered 'complete', primarily due to their low lysine content, this is generally made up through the classic bean + grain combinations which formed the basis of most traditional diets. The amino acid profile of beans (legumes) compliment that of grains but not roots as the amino acid content of roots is simply too low.

The nutritional content of tuberous roots is available on all food composition websites.

There seems to be a **misconception among many that grains and roots are simply 'starches' and are interchangeable in the diet.** This is far from the truth and making the switch puts young children in particular at risk of protein deficiency. Kwashiorkor is commonly seen where the diet is root based without the inclusion of high quality protein sources in the diet. Prepared foods may appear similar and be used in a similar way e.g. fufu from cassava in West Africa is consumed in the same manner as ugali or nsima made from maize meal in West and Central Africa but differs in protein and energy content as the latter is also higher in fat.

In North America food guides separate tubers and grains due to the difference in nutritional content while I have observed that in other parts of the world they are grouped together. This may be problematic for mothers who are unaware of the crucial difference in these foods. Frequently I have found that even health workers are not aware of the crucial nutritional differences between roots and grains.

Cassava provides energy as carbohydrates but little else. As such, where it grows easily it may improve food security but increase protein deficiency. I recognize that grain and legumes are more difficult to grow in many areas and cassava may be the only viable alternative so I am simply addressing the nutritional differences, all other things being equal.

Where cassava replaces grain and beans, what will provide the missing essential amino acids? It is unlikely that animal foods will be available to these households. Here promotion of breast feeding until at least 2 years of age is particularly important. Where small amounts of animal protein (e.g. eggs) are available it is key that these high quality protein sources be given to growing children, pregnant and lactating women whose protein needs per kg body weight are higher. If cassava is grown as an income generating crop, theoretically families could purchase more nutrient dense foods with the added income.

Agricultural changes need to be accompanied by adequate nutrition information/education for negative consequences to be avoided. I will be interested in hearing others' comments.

Judy A. McLean Ph.D.
International Nutrition
University of British Columbia
Vancouver

Contribution by Judy McLean from University of British Columbia, Canada

This table (FAO) might be of general interest in relation to the topic. Cereal grains are notably higher in energy as well as protein per 100 grams and provide some needed fat.

While the leaves of cassava are nutrient dense there are issues of bioavailability and acceptability. Carotenoid absorption is dependent on there being an adequate fat intake, which is not the case in many regions where cassava is now being widely grown e.g. in Rwanda fat intake is estimated to be ~9% of total energy (FAO data).The actual amount of cooked leaves consumed by young children is generally quite low although still a positive in diets that are lacking in diversity.

Table: Average Nutrient Composition (per 100 gm Edible Portion) of Cassava Compared to That of Some Staple Food Crops Found in West Africa

(if the table doesn't display correctly, please refer to the Table 3 at <http://www.unu.edu/unupress/food/8F024e/8F024E01.htm>)

| | Unit | Potatoes | Sweet potatoes | Fresh cassava | Yams | Taro | Maize | Sorghum | Cowpea |
|----------------|------------|------------|----------------|---------------|------------|------------|-------------|-------------|-------------|
| Food energy | calories | 82 | 117 | 146 | 105 | 104 | 363 | 335 | 340 |
| Water | gms | 78 | 70 | 62.5 | 72.4 | 72.5 | 12 | 12 | 10.0 |
| Carbohydrate | gms | 18.9 | 27.3 | 34.7 | 24.1 | 24.2 | 71 | 71 | 60.0 |
| Protein | gms | 2.0 | 1.3 | 1.2 | 2.4 | 1.9 | 10.0 | 10.4 | 22.0 |
| Fat | gms | 0.1 | 0.4 | 0.3 | 0.2 | 0.2 | 4.5 | 3.4 | 1.5 |
| Calcium | mgs | 8 | 34 | 33 | 22 | 23 | 12 | 32 | 90 |
| Iron | mgs | 0.7 | 1.0 | 0.7 | 0.8 | 1.1 | 2.5 | 4.5 | 5.0 |
| Vitamin A | I.U. | tr | 500 | tr | tr | tr | tr | tr | 20 |
| Thiamine, B1 | mgs | 0.10 | 0.10 | 0.06 | 0.09 | 0.15 | 0.35 | 0.50 | 0,9 |
| Riboflavin, B2 | mgs | 0.03 | 0.05 | 0.03 | 0.03 | 0.03 | 0.13 | 0.12 | 0.15 |
| Niacin | mgs | 1.4 | 0.6 | 0.06 | 0.5 | 0.9 | 2.0 | 3.5 | 17.0 |
| Vitamin C | mgs | 10 | 23 | 36 | 10 | 5 | 0 | 0 | tr |

Contribution by Edward Mutandwa from Rwanda Development Agency Rwanda

Dear all,

I got very interested with the topic on "Contribution of cassava development to Food security". However, my contribution should be taken at the conceptual level. Here our interest is to determine the extent of contribution of a given crop (in this case cassava), to the household food economy. My questions are related to the conceptualization and operationalization of food security. What contemporary measures would we use to investigate this concept? For instance, in the questionnaire what issues are included? When do we say a crop has a significant or insignificant contribution to household food security ? . I am raising these questions in view of a previous topic which suggested that there is a difference between nutrition security and food security.

I look forward to contribution by members of the forum.

Edward Mutandwa
RDA, Rwanda

Contribution by Purna Chandra Wasti from Department of Food Technology and Quality Control Nepal

Dear FSN members,

This topic has been floated together with the other (food and nutrition security). Obviously this topic would help to clarify the concept of food and nutrition security.

Of course, cassava has a very significant role in feeding the hungry of the region. However, as many of the colleagues have raised the issues of it's nutritional value, cassava alone can't give any result of food security or nutrition security.

Not only cassava, the other roots and tubers such as potato has a very critical role to feed the hungry of highlands (mountains) of Nepal. But the again comes the nutritional value.

Even cereals are better than cassava or other roots or tubers. However, they can not fulfill the dietary requirements of protein both in terms of quantity as well as quality.

The concept of food security among the professionals has reached the ideal level (including the nutritional quality calorie, protein, micronutrients as well as safety), but the concept among the whole range of general public, planners as well as politicians is still in filling the belly.

In summary, I should say, **cassava has a role to play but together with other food crops as well as livestock products.**

One more thing, cassava has some toxic compounds which can be reduced by means of certain preparation methods. This should also be highlighted. While talking of food security, **the safety aspect along with the quality** (I mean the nutritional quality) has been **neglected**. With this particular example, we should advocate for highlighting the safety aspect of food security.

Thanks to Michael for floating this issue here and also thanks to other scholars/activists who have shared their ideas along with the evidences.

Cheers,

Purna Chandra Wasti
Senior Food Research Officer
Food and Nutrition Program
Department of Food Technology and Quality Control
Kathmandu
Nepal

Contribution by Martin Fregene from Donald Danforth Plant Science Center, USA

1a. What impact on income and food security of the rural poor has been demonstrated? Who gained and who lost?

Cassava is a vegetatively propagated crop and dissemination of new high yielding varieties is slow and consequent impact on processing and marketing will also be slow. Impact of a development project can typically be felt after 10-15 years. In South East Asia, the world's leading commercial producer of cassava, impact of new varieties were calculated to be over US\$1billion added to local farming economy but after 10 years of initial dissemination (Johnson, N.L.; Manyong, V.M.; Dixon, A.G.O.; Pachico, D.H. 2003. The impact of IARC genetic improvement programmes on cassava. In: Evenson, R.E.; Gollin, D. (eds.). Crop variety improvement and its effect on productivity: The impact of international agricultural research. CABI Publishing, Wallingford, GB. p. 337-355.) (<http://www.highbeam.com/doc/1P3-652261081.html>).

2a. Are there any studies on the nutrition value of roots and tubers, and cassava in particular? What would the impact be on the nutrition status of the population when there is a gradual shift from a maize and bean based diet towards a cassava based diet?

Table 1. Provides percentage of minimum daily allowance (MDA) of nutrient intake from roots of currently grown varieties and new GM nutrient-dense cassava varieties being developed under a Gates Foundation project. Currently, cassava is primarily a source of energy and need to be supplemented with other food sources especially vegetables, legume and cereal grains. Only during a time of severe drought is cassava, often the only crop that survives, eaten as a sole crop. But even then, cassava is always eaten with a vegetable sauce, which in Central, Eastern, and Southern Africa contains the leaves.

Table 1. Percentage of Minimum Daily Allowance (MDA) met by consumption of a 320g (fresh weight basis) meal of currently grown cassava varieties and BC+ varieties

| | Energy, kcal | Protein, g | Zn, mg | Fe, mg | Vitamin A, µg |
|--|--------------|------------|--------|--------|---------------|
| Nutrient in fresh cassava varieties commonly eaten in Africa | 477 | 3.8 | 1.3 | 1.3 | 12 |
| % of daily requirement provided | 60% | 29% | 16% | 16% | 4% |
| % of requirement that could be provided by BC+ lab cultivars | 60% | 100% | 78% | 64% | 100% |

http://km.fao.org/fileadmin/user_upload/fsn/docs/MDATable_Cassava.doc

2a. What impact on the environment (soils, forest, water resources, wildlife etc.) can be observed when cassava becomes more important in the farming system? How could negative environmental impact be mitigated?

The biggest impact of cassava on the environment is on the soil via water erosion of the soil when grown as a sole crop; the canopy of cassava closes only after 3 months during which time the soil is exposed and eroded soils often ends up in the rivers. But cassava is never grown as a sole crop in West Africa, so this is generally not a major problem with increased production under current farming systems. If markets for cassava increase and it becomes a sole crop, this could be a problem. In South East Asia and Latin America, this problem has been controlled by various agronomic practices, including the use of live hedgerows, terrace plowing, zero-tillage, etc Other potential impact on forest, wildlife, water resources, is not limited to cassava alone as opening of

new forest areas under bush fallow cultivation is a fact of life of these farming systems

2a. In general, what can we learn from projects and programmes focusing on one single commodity, in particular those focused on cassava?

I am very keen to know what the experiences of the IFAD project and other cassava development projects have been and how we can build upon them more effective development projects in the future. One of the biggest problems of cassava in West Africa is the huge swings in prices of fresh roots over the period of a year with the attendant non- or limited accessibility to processed food from cassava by certain segments of the population, particularly the Urban poor. For example fresh cassava roots are currently being sold in central Nigeria for N14,000 (about US\$90) per ton to village-level processors, the same fresh roots were sold for N7,000 (US\$45) per ton in August, less than a year ago. The success of any cassava development project will have to be evaluated by price stability and all year round accessibility to the poor of cassava products. But I also think it goes beyond just processing and marketing, the seasonality of cassava harvest, long growth cycle of the crop, and relatively low productivity of farmers probably plays a major role. But an organized processing and marketing supply chain will clearly go a long way to lessen the wide swings in prices

2b. What approaches were (or could be) used to target the benefits of this type of projects to the poorest and most food insecure population groups?

Targeting of development projects to the poorest and most food secure population groups is a difficult task given that the poorest are often found in remote areas with poor or limited road access and are often the most under-represented at project planning meetings. One successful way of reaching the poorest is to work with (or create) first-, second-, and third- order community-based organizations; the second and third orders that are often more visible and can reach the remotest first order organization; involvement of local governments becomes useful here.

Martin Fregene Ph.D.

Product Development Manager, BioCassava Plus (BC+)
c/o Enterprise-rent-a-car Renewable Fuel Institute
Donald Danforth Plant Science Center

Contribution by Chikelu Mba from Joint FAO/IAEA Agriculture and Biotechnology Laboratory, International Atomic Energy Agency, Austria

My thoughts regarding cassava (and agriculture in sub-Saharan Africa -SSA- in general, if you may) are however somewhat broader than the questions being posed in respect of this specific project that is under review. I pose following sampling of random questions on the premise that it is a given that cassava is one of the critical leverages for lifting people out of poverty in SSA. Based on this premise therefore, I challenge ourselves with the following:

- Could there be food security without enhanced income for the people (largely farmers)?
- Are adequate arrangements always made to ensure that projects lead directly to enhanced income?
- Do projects envision clear cut roles and entry points for interventions relating to improved planting materials -- moving the outputs of R&D to viable seed systems? Is the public sector the most efficient player in seed systems? Is that the case in food secure parts of the world?
- Are the requisite agricultural inputs available (fertilizer, irrigation, etc.)?

- Beyond public R&D organizations, are other key players clearly identified and their commitments secured?
- Is there the enabling environment for farming as a business (the political will backed by infrastructure, human resource, etc.?)
- Is there a market for the produce?

Are there some safety nets for the farmers and their investments?

With the huge investments being made in cassava and agriculture in general in SSA, it behoves us to begin to address the above. For me, it's pointless investing in agriculture that doesn't make the farmer richer.

Kind regards,
Chike

Chikelu Mba
Head, Plant Breeding Unit
Joint FAO/IAEA Agriculture and Biotechnology Laboratory
International Atomic Energy Agency
AUSTRIA
<http://www.iaea.org/OurWork/ST/NA/NAAL/agri/pbu/agriPBUMain.php>

Contribution by Judy A. McLean from University of British Columbia, Canada

I appreciate the input of plant scientists but am confused by the numbers below. The table indicates that 477 kcal would provide 60% of minimum daily energy needs which means that daily energy requirement is a mere 777 kcal. Similarly, saying 3.8 g of protein would provide 29% of daily protein required means only 13 g of protein are needed. These numbers are below protein and energy needs for all age groups with the possible exception of protein needs for very young children, although in the case of the latter, 13 g would only be adequate if the protein provided all essential amino acids in the amounts needed for growth.

While cassava is normally served with a plant based side dish or 'relish' in many parts of Africa, the side dish is small in comparison to the staple and the combination will not meet the protein, fat and micronutrient needs of young children, pregnant and lactating women. The new varieties may have the potential to do much more but could you please provide the actual amount of protein (essential amino acid content would be better) and amount of iron, vitamin A (RE) as requirements vary across the lifespan and by gender?

Thank you,

Judy

Judy A. McLean Ph.D.
International Nutrition
University of British Columbia
Vancouver, BC, Canada V6T 1Z4

Contribution by Michael Carbon, from the International Fund for Agricultural Development (IFAD), Italy

Thank you very much, Juliane, Judy, Edward, Purna, Martin and Chikelu for your great contributions so far.

Several points seem to emerge that will certainly merit the evaluation's attention:

1. Did the project provide adequate information to mothers about the nutrition value of root and tuber (R&T) products as compared to grains, and about the need to complement their children's diet (or their own when breastfeeding) with protein, fats and vitamin rich food stuffs?
2. To what extent is additional income generated by R&T products used to improve the households' diet?
3. Were R&T processors and consumers adequately sensitized on food safety issues (hygiene, toxins etc.)?
4. Did the project promote safety nets for R&T producers and processors to cope in the years of low prices?
5. To what extent did the project manage to organize R&T value chains in order to reduce price swings to the producer and processor, and promote access for all population groups to high quality processing products?
5. Is the seed production system supported by the project viable without project subsidies?

Martin, on the issue of targeting, could you please clarify what you meant by "first-, second-, and third- order" community-based organizations?

Thanks again to all and I look forward to read more opinions and experiences here,

Michael Carbon
Evaluation Officer
Office of Evaluation
International Fund for Agricultural Development (IFAD)

Contribution by Louis Djilemo from GIC CAIC, Cameroon

Message in French (please scroll down for the English version)

Bonjour

Trouvez ci - dessous mon opinion sur le developpement du manioc.

Le manioc (*Manihot Esculenta Crantz*) est une plante très plastique c'est-à-dire capable de s'adapter à la plus part des sols et des climats. Le manioc par ses multiples dérivés constitue l'alimentation de base de près de 80% de la population africaine en générale.

Le développement de la culture du manioc en grande quantité a permis de produire d'améliorer la qualité et la quantité des produits transformés locaux du manioc (gari,...) ,et dérivés nouveau (farine de manioc pour la fabrication du pain, de l'amidon pour les agro-industries et les cartonneries). Cette part du marché que les paysans ont occupé permet d'augmenter leur revenu. La farine de manioc produite est l'origine d'une nouvelle alimentation dans les villages

(fabrication du pain, beignet, gâteau, crêpe, à la farine de manioc). Les revenus et la sécurité alimentaire connaissent un début d'amélioration qu'il faudrait pérenniser.

Composition du manioc

Les feuilles: riches en protéines (20 – 25%)

Les racines: pauvres en protéines et riches en glucides essentiellement de l'amidon (22-35%)

Les feuilles et racines contiennent des glucosides cyanogéniques qui sont toxiques. Ces composés cyanogéniques sont la linamarine (93 à 96%) et la lotaustraline (4 à 7%)

La culture intensive itinérante du manioc pourrait contribuer à intensifier la déforestation c'est-à-dire à la destruction de l'environnement. Mais actuellement il existe des formulations des fertilisants (engrais), les boutures améliorées et les techniques culturales qui permettent d'augmenter la production et la productivité du manioc sans augmenter de superficie déjà emblavée (cultivée)

Le programme axé sur la culture du manioc nous apprend à produire les dérivés (farine de manioc non fermenté, amidon) de manioc pour limiter l'importation et réduire la dépendance de l'alimentation de l'extérieur. Il apprend à garantir la sécurité alimentaire et créer de nouvelles sources de revenus.

La méthode basée sur le principe du diagnostic participatif doit être la clé pour le choix des populations bénéficiaires du projet.

Un programme de la culture du manioc est à encourager pour permettre à la population bénéficiaire de trouver une solution interne pour la lutte contre la faim et la pauvreté.

Louis Djilemo

Ingénieur Agronome
Spécialiste en technologie post-récolte
Chercheur en Développement
Cameroon

Message in English

Hello,

Please find below my views on the development of cassava.

Cassava (*Manihot esculenta* Crantz) is a plant that is adaptable to most soils and climates. Cassava through its many derivatives is the staple food of nearly 80% of the African population in general.

The development of the cultivation of cassava in large quantities has allowed for the improvement of the quality of local products derived from cassava (gari, ...) and for the development of new derivatives (cassava flour for making bread, starch for agro-industries and cardboard factories). This market share held by farmers has contributed to the increase of their income. Cassava flour is at the origin of new foodstuffs in the villages (cassava bread, donuts, cakes and pancakes). Income and food security have begun to improve and this should be made sustainable.

Composition of cassava

Leaves: rich in protein (20 - 25%).

The roots: poor in protein and rich in carbohydrates, mainly starch (22-35%).

The leaves and roots contain cyanogenic glycosides which are toxic. These compounds are linamarin (93 to 96%) and lotaustraline (4 to 7%).

Intensive shifting cultivation of cassava could intensify deforestation i.e. the destruction of the environment. But currently there are appropriate fertilizer formulas, improved cuttings and cultivation techniques that allow for increased production and productivity of cassava without increasing the cultivated areas.

The program which focusses on cassava shows us how to produce cassava derivatives (unfermented cassava flour, starch) to limit imports and reduce the dependency on external food sources. It shows us how to ensure food security and how to create new sources of income.

The method based on the principle of participatory needs assessment should be key to targeting intended project beneficiaries.

A program for the cultivation of cassava is to be encouraged to allow the target population to find an internal solution to fight against hunger and poverty.

Louis Djilemo

Agronomist
Post-harvest technologies Specialist
Development researcher
Cameroon

Contribution by Martin Fregene from Donald Danforth Plant Science Center, USA

Hi Judy,

Below is a response to you from BC+ Nutritionist. He has been travelling hence the late response.

Cheers

Martin

The table was constructed for 2-5 year old children, who need only 750 kcal/ day and 13 g of protein. We chose this as a target group because this age group is most likely to be nutrient deficient and if we can meet the needs of this group, all other groups will be met as well.

If we are talking about people eating a little cassava as a snack, this improved cassava will have no impact. But we have data suggesting there are people who eats lots of cassava. We are documenting that millions of people in Nigeria and Kenya eat cassava as a staple.

Take some data from Nigeria.

3.2% of children take > 50% of dietary energy from cassava = 4.8 million people fall into this category

10.5% of children take > 25% of dietary energy from cassava = 16 million people fall into this category

16.5% of children take > 15% of dietary energy from cassava = 25 million people fall into this category

25.8% of children take > 5% of energy from cassava = 39 million people fall into this category

We can certainly completely address the protein, Vitamin A and iron needs in the first 2 categories, address much of the protein, Vitamin A and iron needs in the third category and help people somewhat in the fourth category.

Table 1. Percentage of Minimum Daily Allowance (MDA) met by consumption of a 320g (fresh weight basis) meal of currently grown cassava varieties and BC+ varieties

| | Energy, kcal | Protein, g | Zn, mg | Fe, mg | Vitamin A, µg |
|--|--------------|------------|--------|--------|---------------|
| Nutrient in fresh cassava varieties commonly eaten in Africa | 477 | 3.8 | 1.3 | 1.3 | 12 |
| % of daily requirement provided | 60% | 29% | 16% | 16% | 4% |
| % of requirement that could be provided by BC+ lab cultivars | 60% | 100% | 78% | 64% | 100% |

Contribution by Louis Djilemo from GIC CAIC, Cameroon

Message in French (please scroll down for the English version)

Dear colleagues,

I would like to add some references and additional information to my earlier contribution. I would be available to provide the community with any further information on this topic.

My opinion on cassava development is based on many years working on cassava with different projects. I have been working as an agricultural extension agronomist since 1985. I participated actively in the popularization of improved varieties of cassava developed by IRAD research in Cameroon (8017, 8034, 8016) in 1988. In 1990 I worked at "Food loss reduction programme ", which was funded by FAO in the North West, Cameroon. From 1991 to 2000 I was responsible for training village extension officers (AVZ) on techniques for reducing post-harvest losses in PNVFA (National Programme for Extension and Agricultural Education) funded by the World Bank.

From 2000 - 2005 I was responsible for the cassava value chain in the coastal areas of Cameroon. Thereafter I worked with several NGOs (APIC, APRIS). I accompanied diverse farmer organizations seeking solutions to satisfy customers with derivatives of cassava (starch, cassava flour and no smell of fermented).

I do not know if the documents on these projects and programs exist on the Internet but I know that the reports exist in the literature of the country.

I have worked as a phytosanitary inspector since 2005. This helps me to understand the origin of products processed in agro industrial plants. These industries import very large amounts (thousands of tonnes) of starch, essentially from processed cassava. I have noticed that derivatives of cassava can be produced locally and could be a source of income for our people.

This led me to developing a **drying oven (Djilemo oven)** that was awarded the best prize in technological innovation during the workshop fair organized by IFAD and its partners in

Ouagadougou, Burkina Faso in 2008 (http://fao08.fidafrique.net/djile_fao08.ppt#1 and <http://fao08.fidafrique.net/Fiche39a-DjilemoOven-Cameroon.pdf>) and was also the winner of OUGA 2008 (<http://www.fidafrique.net/article1659.html> and <http://www.fidafrique.net/article1658.html>).

I also made a communication in Abidjan, Côte d'Ivoire titled " **Unfermented Cassava flour: The Future of Cassava cultivation in Africa**" (<http://archives-cassava.fidafrique.net/pdf7ZaodwR5t5.pdf>).

After almost 25 years working on cassava, I think cassava development accompanied by a processing technique for prolonging storage could be a good source of income and a means to fight poverty and hunger.

Although cassava is a highly perishable, its consumption throughout the year is possible by means of good processing (drying).

Louis Djilemo

Agronomist Post-harvest technologies Specialist
Development researcher
Cameroon

Message in French

Trouvez ci dessous quelques references et information supplementaires sur ma contribution. Je suis disposé à donner à toute la communauté toutes les informations sur le sujet.

Mon opinion sur le manioc est basee sur plusieurs d'années de travail dans ce domain, sur différents projects. Je suis ingénieur agronome vulgarisateur agricole depuis 1985 . J'ai participé activement à la vulgarisation des variétés améliorés du manioc mise en place par la recherche (IRAD) au cameroun (8017 ,8034 , 8016) en 1988 . En 1990 J'ai travaillé au « Food loss reduction programme » un programme financé par la FAO au Cameroun dans la région du Nord Ouest. 1991-2000 Je suis chargé de la formation des agents de vulgarisation du village (AVZ) sur les techniques de réduction des pertes après récoltes au PNVFA (Programme National de vulgarisation et de Formation Agricole) financé par la Banque Mondiale.

De 2000 - 2005 Je suis chargé de la filiere manioc dans le littoral cameroun. Par la suite j'ai travaillé avec plusieurs ONG (APICA ,APRIS) . J'ai accompagné plussieur organisations paysans de la récherche de solution pour satisfaire la clientelles des produits dérivés du manioc (amidon, et farine de manioc sans odeur de fermenté).

Je ne sais pas si les documents sur ces différents projets et programmes existent sur Internet mais je sais que ces rapports existent dans les documentations du pays.

Je suis inspecteur phytosanitaire depuis 2005. Cette situation m'a amené à comprendre l'origine des produits à transformer dans les usines agro industrielles . Ces industries importent en très grande quantité en milliers de tonnes de féculés ou d'amidon qui sont surtout du manioc tranformé. J'ai constaté que ces dérivés du manioc peuvent être produit localement et pourraient constitué un gain pour nos populations.

Cela m'a conduit à mettre en place un **four de séchage : le four Djilemo** qui a été désigné meilleur prix en innovation technologique au cours de l' atelier foire organisé par le FIDA et ses partenaires à Ouagadougou , Burkina Faso en 2008 (http://fao08.fidafrique.net/djile_fao08.ppt#1 et <http://fao08.fidafrique.net/Fiche39a-DjilemoOven-Cameroon.pdf>) et les lauréats de OUGA 2008 (<http://www.fidafrique.net/article1659.html> et <http://www.fidafrique.net/article1658.html>).

J'ai fait une communication à Abidjan en Côte d'Ivoire sur "**La farine de manioc (Manihot**

sculenta Crantz) non fermentée : L'Avenir de la culture du manioc en Afrique"
(<http://archives-cassava.fidafrique.net/pdf7ZaodwR5t5.pdf>).

Après près de 25 ans que je travaille sur le manioc je pense que le développement de la culture du manioc accompagné d'une technique de transformation qui permet de fabriquer des dérivés capable de se conserver pendant longtemps et bonne qualité serait une source de revenu et moyen de lutte contre la pauvreté et la faim.

Bien que le manioc soit une denrée très périssable une bonne transformation (Séchage) peut permettre de le consommer toute l'année.

Louis DJILEMO
Ingénieur Agronome
Spécialiste en technologie post-récolte
Chercheur en Développement
BP: 257 Douala, Cameroun
Tél: 237 99 91 43 33
Email: djilemo@yahoo.fr