Cassava Cultivators and their cultivars. (Preliminary results of case studies in the Sierra region of the Dominican Republic)

Author: Louk Box, Adaptive Agricultural Research Project, Wageningen Agricultural University.

ABSTRACT

Cassava cultivators in the sierra region of the Dominican Republic have been selecting varieties on the basis of tolerance to degraded soils, length of production cycle, and market preferences. Given prevailing ecological conditions, cassava cannot be kept indefinitely in the ground, but must be harvested within two to three years to prevent root deterioration . The "piggy bank function" of cassava does not appear to exist anymore to the extent previously suggested in the literature.

The preliminary results of agro-sociological case studies on cassava cultivators are presented, to be confirmed by ongoing research.

Introduction

Why do peasant cultivators grow different varieties of cassava? The question first struck me in the Dominican Republic while preparing a research project on field problems in cassava cultivation as perceived by the growers.*

Biosystematic researchers and anthropologists agree on the great proliferation of cassava varieties in the western hemisphere. Rogers & Appan (1973) using an exhaustive taxonomic classification arrived at surprising numbers of varieties. This confirms anthropological field research, particularly ethno-botanical studies. Berlin & Berlin (1977) in recent work among Aguaruna cultivators of northern Peru, report that 30 varieties are being grown at one particular time. They note, however, that about 100 varieties are known among the Aguaruna, possibly even as many as 200 (Berlin & Berlin, 1977: 11; 25).

In previous research in the Dominican Republic, I had noted the amazing amount of knowledge regarding varietal characteristics among peasant farmers (Box, 1979).

*The question was also raised by Dr. James Cock, of CIAT's cassava team, while the author was preparing the field research in the Dominican Republic. The present paper is a partial response to his question.

Lacking was methodology to find out why cultivators grow these varieties. Although highly refined botanical methods exist for distinguishing cassava cultivars, and a fairly well developed technique emerges from anthropological studies on ethnobotany (Berlin, Breedlove & Raven, 1973), this is to no avail when one has to give a fairly rapid answer to the question. One complaint of biological scientists against anthropologists is that their work may be interesting, but gives too much information on too little, and too late (for a response see Brady et al., 1982). I intended to develop a technique to give a rapid, approximate answer to biological scientists who could then decide if they wished to investigate the matter further with refined methods.

Methods and Techniques

The variety-study formed part of a larger agro-sociological research on cassava cultivators in the Dominican Republic. This was aimed at the question: what are appropriate agro-sociological methods and techniques for identifying cultivation problems which are both felt by farmers and considered fit for study by agricultural researchers? In other words, we were not interested in establishing a list of all problems felt by the farmers and not in doing a general sociological survey on the social structures they are part of. Finally, we did not test technology because almost no scientifically derived technology has been adopted by cassava cultivators in the Dominican Republic (Box, 1982: 9).

The research team's interest was exactly in this lack of adoption. Could it be that the new technology did not provide solutions to the cultivator's problems?

In preparing the research we found several things, from actual experience, and from conversations with colleagues in agricultural research institutes** we worked with:

1. If you want to know about problems in cassava cultivation, do not start out asking for them because you are likely to receive fairly general, standard answers which are hardly relevant to the biological scientist charged with studying them;
2. Varietal selection has been a dominant mode of solving cultivation problems among cassava growers;
3. A historical approach to varietal selection may provide clues to reasons for changes in the cultivation system and may thereby indicate significant problems producers faced and face.
4. The capacity to articulate reasons for changes in the past is not equally distributed among the population of cultivators. Some growers are more aware of these reasons than others. Therefore it is better to start an investigation with those, who through experience and reflection are regarded as knowledgeable by their peers.

Starting from the premise that agricultural scientists play a key role in the process of problem solving we began by asking them what they considered to be the problems facing cassava cultivators. This gave us a first indication of significant problems and of the geographical area they were associated with.

With this knowledge we went to the particular regions and identified farmers' organizations and extension agencies which were locally operative. We repeated

** CIAT, CENDA (Centro de Desarrollo Agropecuario, Zona Norte) and ISA (Instituto Superior de Agricultura); the latter two are in Santiago, República Dominicana

the same questions and got another list of problems. We also asked them to bring us into contact with cassava cultivators respected by their fellow-growers for their knowledge and experience. These should be people who were known to have engaged in systematic observation of changes in the cultivation-system, if possible generated by themselves. We called these people "experimenters," not because they engaged in scientific trials, but because they did the thing coming closest to it among common cultivators.

Locating "experimenters" was no problem. In each community a number of growers are regarded as more informed. The existence of farmer organizations like unions, cooperatives or clubs facilitates the process considerably. A preliminary conclusion and hypothesis for further testing is that the degree of integration of knowledge on experiences with a particular crop in a particular area, is correlated with the degree of formal organization among its cultivators.

If this hypothesis is validated, the resulting proposition has definite implications for the organization of agricultural research. For this would mean that through a judicious selection of informants in organized communities, agricultural researchers could become aware of cultivators' problems. For communities of growers with less social organization, other methods would be needed.

Each prospective informant was visited and was asked a few questions on his knowledge and experience in cassava cultivation. If we found that he could rapidly indicate selected characteristics of both past and present varieties, or had engaged in the types of experiments mentioned, and had the opportunity to partake in a time consuming interview, he was selected. As part of the second visit, a number of questions were asked on past and present varieties grown, reasons for changeovers in terms of advantages and disadvantages of each variety, and finally a resumé in terms of characteristics judged relevant in the selection of current varieties.

These interviews were coupled with field observation and soil analysis. The whole process took about a day per informant. On the whole, some 40 case studies were done following this recipee; 18 cases were in the Sierra region and the following preliminary conclusions are based on their analysis.

Preliminary results

On the basis of the 18 case studies, plus about a dozen complementary interviews on an ad hoc basis (in places where no case study was done), a list of 103 labels *** could be drawn. But to how many varieties do these labels refer? Some varieties are known under more names. But one name may also refer to quite distinct varieties. If one asks a farmer what varieties he is cultivating, he may give a generic classification in terms of the most general type of cassava: bitter, sweet or somewhere in between. This may be followed after some urging by a general color indication: black, white, yellow or in some cases red. These refer to rootskin color, the color of the pulp (before or after cooking) or the color of the foliage or trunk. In other cases a proper name might be mentioned like Facundo, Ricardo or Zenón. Or reference is made to a particular quality, characteristic or special trait of the plant, the tubers or the location it came from. Qualities like size (Chiquita, Mediana or Grande), stem or trunk color (Palote

*** Label: local name for particular variety.

colorado), leaf color (Hoja de rosa), new-leaf color (Cogollo morado), color of the extracted pulp-juice (Agua de coco), or color of the cooked tubers (Yema de huevo). Proper names may be given (like Corocitera, derived from a village called Corocito, Maguera from neighbouring Magua, or Jobera from a site called Los Jobos), or combinations of any number of these with previous traits (Sanjuanera grande). Finally a number of general qualities might be referred to, such as the fact that the variety produces sweet tubers in some periods, but bitter at other times (Agriadulce, Amarga dulce), that the leaves may be so poisonous as to kill a cow eating them (Ahoga vaca, Matavaca), or that the taste of the roots is so good that you want more (Damemás). Now comes the difficult step. Finding out what labels belong to what varieties, on the basis of cultivators' knowledge. Using the characteristics, as well as available synonyms, we arrived at a preliminary classification. In it, the 104 labels are redistributed over 63 potential varieties. "Potential" because a definitive classification can only be made after detailed botanical work. Such work will probably reduce the number of past and present varieties to less than 60, but in excess of about 20 varieties currently available in the CENDA collection (Personal communication, M. Rodríguez, 1981).

Several things must be noted. First, labels may be poor indicators but consensus among cultivators in a particular region exists. Second, the same label may be used for varieties with quite different characteristics, such as in the case of Machetazo. It is a common label associated with sweet varieties having a yellowish pulp. Third, even varieties which appear to be well identified with one name on which consensus exists among cultivators, do have local variations which maybe only some farmers recognize.

Why more varieties?

The question as to the multiplicity of varieties may be broken down into two:

a) Why do cultivators grow different varieties over time, i.e. why do they change from one variety to the other (or, from one type of varieties to another type);
b) Why do they grow different varieties at one given time?

Let us first look at the data of cultivators of whom we have enough information to answer both questions (Table 1). The number of known varieties among these informants varied between 6 and 21, with an average of about 14. This means that 14 varieties could be described on the basis of own experience. On the whole, informants had more sweet than bitter varieties. They knew an average of about 5 bitter varieties, against 9 sweet ones and cultivated actually an average of 2 bitter against 4 sweet varieties.

This general observation is confirmed by the number of known varieties where 28 bitter varieties are mentioned against 35 sweet ones.

So at least for this group of cassava cultivators it is clear that they do grow more than one variety and that they have experience with about twice the number they actually cultivate.

Why have they changed from one variety to another? It is yet too early to make any definitive statements but on the basis of the case studies we can select those varieties which were grown in the past but not in the present ("historical varieties"), those grown in the past which continue to be cultivated in the

Table 1. Different varieties grown by selected informants in the Central Sierra region (Monción) of the Dominican Republic (1982).

N° Informant	Community	Number of Varieties Grown Past[1] Bitter[3]	Past[1] Sweet	Present[2] Bitter	Present[2] Sweet	All
S 2	Jicomé	-	6	-	4	6
S 4	Dejao-Arr.	5	13	-	4	18
S 6	Pamarejo	5	4	3	2	9
S 7	Monción	3	6	1	2	9
S 8	Palmarejo	4	7	2	3	11
S 10	Veladero	6	9	1	2	15
S 11	Veladero	6	8	2	3	14
S 12	Meseta	4	9	3	6	13
S 13	Rodeo	6	15	2	8	21
S 14	Gurabo	4	9	1	4	13
S 15	Corocito	5	8	3	6	13
S 16	Jicomé	5	14	3	5	19
S 17	Dajao-Arr.	6	14	2	3	20
S 18	Cacique	5	8	2	3	13
Averages		4.9	9.3	2.1	3.9	13.9

[1]Includes varieties grown by others on the farm, but of which informant has sufficient knowledge to describe.
[2]Includes all varieties currently grown, including ones for experiments.
[3]Includes bitter-sweet varieties (which are almost not cultivated in 1982, due to the disappearance of the pigs which fed on them).

present ("classical varieties"), those grown actually and are of recent origin ("newcomers") and those grown in the recent past, but the cultivation of which was discontinued ("drop-outs") (see Figure 1).

Figure 1. Classification of varieties according as to whether or not they are actually cultivated vs. whether or not they were introduced.

		Actually cultivated? Yes	No
Recently	Yes	"Newcomers"	"Drop-outs"
Introduced?	No	"Classics"	"Historicals"

This diagram can only be made for particular cultivators. It is hard to generalize, since a variety which is a recent introduction for one, is a "classic" for someone else. In the Sierra situation, no general patterns for the spread of varieties could be recognized. So generalization remains rather hazardous, as far as specific varieties is concerned. It becomes somewhat easier if we abstract from varieties and classify by traits or qualities (which may or may not be as-

sociated with a given variety under given conditions). If we elaborate the data accordingly, Table 2 emerges.

Table 2. Classification of varietal traits according to actual cultivation, vs. recency of introduction by positive (+) and negative (-) points.

	Actually Cultivated ?	
	Yes	No
Recently introduced ?		
Yes	+ yields higher + short cycle + tolerates poor soils + starch content[0] + market value - taste - tolerance to delayed harvest e.g. Facundo[0] Damemas	+ yields + cycle shorter + taste - tolerance poor soils - market value - resistance root rot - availability planting material - degeneration plant material e.g. Agua de coco[0] Tres meses
No	+ acceptable yields + taste + tolerance to delayed harvest - cycle (long) - tolerance poor soils ± market preferences[1] e.g. Media carga[0] Amarilla grande	+ taste + tolerance to delayed harvest - tolerance to poor soils - cycle - market value/preferences - availability planting material - degenerating plant material e.g. Veinte reales[0] Lula

[0]) Refers to bitter varieties.

[1]) For bitter varieties: "bitterness", "color", "starch content", "color of final product after baking".

Facundo is the typical case of variety which was recently adopted by farmers producting bitter cassava for local factories, which make casabe or flatbreads of it. The market for casabe increased considerably over the past 10 years and so did the cultivation of the Facundo variety which the factories prefer for its starch content, stable HCN level (or toxicity) and tuber shape and size. It withstands the generally degraded soils farmers are obliged to use, has a shorter cycle than the 2 or 3 years which generally are needed for other varieties, and its planting material is available and trustworthy.

But like some other varieties which are recently introduced it has one negative point. According to certain farmers it is more susceptible to root rot when left in the ground. A variety like Media carga yields less and has a longer cycle, but would be more tolerant of delayed harvest.

This means that certain farmers stick to some of the "classics" because they reduce the risk of croploss due to root rot. The effect of this strategy is not yet known. If root rot is caused by poor drainage of the soil it attacks both types of varieties.

On the whole, our informants indicated that given the conditions of depleted soils or rapidly depleting soils, cassava cannot be kept indefinitely in the ground. Only few informants indicated that under certain conditions the harvest could be delayed after 2 or 3 years. In the case of bitter cassava, either root rot or drastic reduction of starch content was reported. Sweet varieties suffered from the same problems, plus increasing bitterness in taste.

Conclusions

Using a modified ethnoclassificatory approach to cultivar identification, using both cultivators and researchers as judges in an iterative process, the author could distinguish 60 cultivars on the basis of preliminary results. This suggests a far greater diversity of cultivars than could be expected on the basis of existing collections or reports.

A succession of cultivars is established over the past 50 years, suggesting continuous search for plants which are well adapted to prevalent cultivation conditions and market preferences. This suggests, in turn, a far greater amount of cultivator experimentation with cassava than has hitherto been acknowledged. Cassava cultivators can hardly be defined as traditional farmers in this respect: they innovate whenever conditions permit.

The primary characteristics cultivators appear to have selected contemporary cultivars on, are their capacity to grow on soils with declining fertility, yielding marketable roots in ever shorter production cycles. The main problem faced with selected cultivars is root rot, even on relatively well drained hill lands.

Under these conditions the so called "piggy bank function" of cassava cultivation does not appear to exist anymore.

Cassava cannot be kept indefinitely in the ground, but must be harvested in time to prevent substantial harvest losses.

Sociologists and economic anthropologists can assist such research by clarifying the rationale for the existing cultivation system and by indicating the changes currently taking place.

This is not an exclusive contribution of the social sciences.

Agronomists with a broad view of the cultivation system could generate the same questions. If they are trained adequately, they may come up with comparable answers. But in teams which force agronomists to be quite specialized, the social scientist contributes by generating a link between existing farmer knowledge and research establishments.

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