STRATEGIC CASSAVA R&D PLANNING ACTIVITIES TO MAXIMIZE FUTURE IMPACT [1]

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ABSTRACT

Financial and human resources for national and international cassava R&D have traditionally been a scarce good. In order to optimize the return on research investment, cassava R&D needs to be well focused, generating appropriate technology components to maximize adoption and subsequent impact.

Both international and national research institutions have been aware of this and have emphasized the development of methodologies and strategies to accomplish this. ISNAR has developed a Strategic Research Planning exercise that can be applied to refocus and reorganize cassava R&D activities and/or programs. In the paper an example is given of such a planning exercise in the case of cassava research in Vietnam.

While the latter exercise can generate recommendations for the more general structural and organizational issues, another case is presented of a strategy followed by CIAT in collaboration with Latin American national cassava program, in which cassava production, utilization and market research activities, are integrated, which has been both efficient and effective in maximizing impact at the producer, processor and consumer level.

INTRODUCTION

The important role that cassava plays in agricultural development is only now being recognized. Although cassava is the basic carbohydrate provider for more than 500 million people in the tropics and has the potential to produce, second only to sugarcane, the highest volume of calories per hectare per growing cycle, relative investment in cassava R and D globally is significantly lower than for primary crops like maize and rice. This situation has led to cassava being labeled the "orphan crop" (Persley, 1992).

Besides the absolute underfunding of cassava R&D, there oftentimes exist an imbalance in the funds allocated between research infrastructure, operating funds and human resources, leading to an inappropriate emphasis of on-station experimentation. Another situation that can often be observed is the lack of an interdisciplinary approach to the alleviation of production and utilization constraints. In many national programs the few funds available

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for cassava R&D are barely enough to cover breeding and agronomic or biological R&D activities with often a total absence of input from the social sciences. To a lesser extent this also applies to postharvest/utilization specialists. Another lissue, that applies not only to cassava R&D but also to many agricultural research programs in general, is the lack of integration with technology transfer activities which are undertaken separately by departments of extension.

These, and many additional constraints, lead to low technology adoption and impact. This paper presents a strategic cassava research planning methodology that may help to alleviate some of these constraints and thereby make more effective and efficient use of the research funds available. The case of Vietnam is described where such an activity is currently underway. Following, an integrated cassava R&D philosophy is discussed as a strategy to maximize cassava R&D impact.

STRATEGIC RESEARCH PLANNING: A METHODOLOGY

The International Service for National Agricultural Research (ISNAR) has had a long experience analyzing national agricultural research in many LDCs. This has resulted in several innovative approaches and methodologies. Strategic planning[3] is one such approach. Hence, the goal of strategic planning is to match objectives to available resources and defining ways to achieve the objectives, given these resources; and this, through an iterative process (Collion, 1989).

The strategic planning follows a sequence of activities or processes, that include the following: (1) analysis of current status; (2) environmental analysis; (3) Determination of the desired future; (4) gap analysis; (5) long-term program formulation; and (6) action plan.

Analysis of the Current Status:

The collaborating institutes have to assess their actual objectives, strategies and output (performance) in order to identify the institutes strengths and weaknesses. As such, the relevance of the allocation of physical, human and financial resources to each program vis-a-vis the research impact needs to be analyzed. In addition, the efficiency and effectiveness of the research organization in relation to achieving its objectives needs to be assessed. The type of research organization (by crop, by discipline, by theme, etc.) includes the mix of disciplines and the relevant interaction with the "users" (farmers, processors, etc.) and extension agents.

[3] This section draws heavily upon the work at ISNAR on Strategic Planning by Collion (1989).

Environmental Analysis:

The goals and mission that are assigned to the institutes are supposed to be the results of the environmental analysis at the national level. Issues that have to be dealt with at the institute level include (Collion, 1989; pp.37):

(1) Economic policies that are relevant to the research mandate of the institutes.

(2) Specific linkage mechanisms with extension services for the diffusion of technologies.

(3) Assessment of the socio-economic and political environment of the mandate areas.

(4) Characterization of the institutes clients (or users).

(5) Specific interests from "stakeholders" (like donors, etc).

(6) Linkages with (national) other research institutes, universities, NGO's, and private sector (industry).

(7) Linkages with international organizations (with respect to mutual beneficial research activities).

Determination of the Desired Future:

While in the environmental analysis the current status of research vis-a-vis the current goals and mission of the institutes are assessed, in this activity, the issue of "what should be our objectives given the goal and mission laid down by the national government" needs to be discussed. As such, new or revised objectives may be proposed.

Gap analysis:

In this analysis one compares the current and desired status of the institutes taking into account the environmental conditions, emphasizing organization, distribution and level of resources by different objectives. Given differences in objectives and assigned resources, a dialogue between the institutes and the national level will attempt to resolve this.

Long-term program formulation:

In order to translate the institutes (new) objectives into specific programs, the following questions need to be answered based on the collected information of the current status and environment analysis (Collion, 1989):

(1) What are the objectives and what are the major constraints to overcome? To what extent are these technical and researchable?

(2) If the problems are researchable, can the constraints be removed by using present knowledge?

(3) Following the objectives what are the problems in order of priority and what is the appropriate "research path"?

(4) For each of the researchable problems what is the institute's comparative advantage vis-a-vis other collaborating (national or international) institutes? This also includes the assessment of the research strategy regarding basic, applied, and adaptive research, and on station vs. on-farm research.

(5) What will be the probability of successful adoption and impact of the research and what will be the research lag time and adoption time and ceiling?

(6) What will be the critical mass of resources needed? How much is available in-house and what needs to be looked for elsewhere?

Action Plan:

While most of the development of the strategic plan so far has been conducted by research managers, the implementation into a plan of action must be done by the scientific staff itself. The minimum unit of detail for the action plan should be a research project. A research project is mostly an interdisciplinary activity, which should be clearly outlined with specific objectives, methodology, expected results, collaboration, time table and resource requirements.

At this stage the strategic planning has visited all aspects of objectives, problems, priorities, organization, strategy and resource allocation in such a way to optimize an efficient and effective investment of (scarce) research resources. In the next section, a diagnostic and analytical base-line study called "benchmark study", is discussed that generates information regarding the "current status" and "environmental analysis" for cassava research planning in Vietnam.

BENCHMARK STUDY AND NEEDS ASSESSMENT IN VIETNAM

In 1989 the Vietnamese Ministry of Agriculture took a significant decision to coordinate all Vietnamese research on cassava, sweet potato and potato through the newly founded Vietnamese Root and Tuber Program. This decision was the first major step toward a strategic reorganization of root and tuber research in Vietnam. Then in 1990 Vietnamese

cassava researchers approached CIAT for assistance in developing and executing a cassava sector needs assessment. This has resulted in a series of cassava production, processing, utilization and marketing analyses (Binh et al., 1992; Henry et al., 1993) as principal elements of a strategic planning exercise. The main activities were the following:

1. Organization of research teams: Multidisciplinary and inter-institutional research teams were formed between a group of 7 research institutes and universities from both North and South Vietnam. Research methodologies were developed and survey teams were trained. A Vietnamese economist was trained at CIAT in computer processing and survey data analysis.

2. Cassava farm-household survey: This first survey focused on cassava production, on-farm processing, utilization and consumption aspects. It included questions regarding first-level marketing strategies, farm-gate prices and production and processing costs. In addition, respondats were asked to rank major constraints. The representative survey covered the major cassava production regions in 6 agro-ecological zones. A total of 1076 questionnaires were analyzed.

3. Rural, semi-urban and urban marketing and processing survey: This survey focused on both technical and socio-economic aspects of the different processed cassava products and major marketing channels. Questionnaire respondents included farmers, processors, middlemen, and wholesale and retail traders in the major cassava producing, processing and consumption (utilization) areas of Vietnam.

4. Vietnamese Cassava Workshop: This workshop had the objectives to (i) explain the framework and activities of the strategic cassava planning exercise; (ii) present the preliminary results of the descriptive analyses of the cassava sector; (iii) present the governments views regarding cassava within the future national agriculture development plan; discuss the role and organization of technology transfer; and (iv) present a first approximation of cassava constraints and opportunities for a tentative cassava R&D agenda.

In order to look at the impact or value of the Vietnamese Strategic Cassava Research Planning Exercise so far, the major outputs include the following:

(a) Cassava R&D has been centralised and there is an organisational inter-institutional structure with coordinators by research theme. There now exists increased communication and collaboration between cassava researchers in different institutes and between North and South. In addition, the new structure has allowed an organized and centralised cooperation with international research institutes and donors, which is functioning effectively and more efficiently.

(b) Cassava researchers can now rely upon representative cassava sector data by zone, province and district which can also serve as baseline data for future technology adoption and impact studies. In addition, this information includes a prioritized needs assessment at the user level, which can give researchers a better idea of local cassava research needs.

(c) The information presented in the Vietnamese Cassava Workshop was afterwards discussed by the Vietnamese researchers in a meeting to assess the progress and further needs within the Strategic Planning Exercise. This generated a set of recommendations for further studies (Henry, 1992). It also recommended that a Vietnamese Cassava Research Network be established to coordinate future research efforts, collaboration and project proposals, among institutions throughout the country.

THE INTEGRATED CASSAVA R&D PHILOSOPHY

While in the previous section an example was shown of a Strategic Planning exercise, generating, amongst other, recommendations for priority research themes and institutional organization, this section gives an example of strategic research implementation. It shows how different research themes are strategically integrated for optimal efficiency.

The basic premise behind CIAT's Cassava Program philosophy for integrating research activities goes back more than a decade when, in the face of decreasing consumption of traditional cassava products in Latin America and therefore decreasing production, especially in those areas with limited crop alternatives, it was recognized that high production and market risk at the producer level significantly depresses the demand to adopt improved cassava production technologies that supposedly should be the vehicle by which the small scale cassava farmer can reduce his costs and generate increased income[4]. Cassava farmers in the face of a depressed market and highly fluctuating cassava prices did not want to add a further risk associated with the adoption of "improved" technology to their already very high production and market risks. Hence, the integrated cassava project philosophy[5] was born where market and utilization research activities develop alternative cassava uses and products which will broaden demand and stabilize prices. The latter translates in reduced risk at the farm level and hence creates incentives to adopt cassava production technologies.

In most production areas, cassava faces a complex of climatological, agronomic, biological

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[4] For a detailed discussion on this see Lynam and Janssen, 1992.

[5] See Perez-Crespo (1992) for a complete treatise of this philosophy.

and economic constraints. Among these constraints, those related to markets and edaphoclimatic conditions are the most influential in determining the potential of the crop. It is therefore useful to classify and characterize cassava production regions according to their relative market situation and possibilities for alternative crops. In general, four contrasting situations in which cassava is grown can be recognized (see matrix).

CAN ADOPTION AND IMPACT BE OPTIMIZED?

Let us consider that, based on user needs assessment analysis, cassava research is divided into 3 research areas. These areas are varietal improvement, crop management and post-harvest/market research. To explain the difference in benefits (level of yield gain x level of adoption in a fixed time period) obtained from including utilization/market activities and crop management with varietal technologies, imagine a hypothetical R&D activity for case 1, in a semi-arid agro-ecosystem where drought, soil fertility and planting material quality are the major constraints. In addition, the market consists of only one traditional cassava product which experiences very strong inter-seasonal price fluctuations. The different research activities and subsequent impact are demonstrated in Table 1.

In this hypothetical case, if R&D is conducted only on varietal improvement, benefits are lowest. They will improve with the incorporation of management components, increasing from 300 to 450. The integration with crop management research, besides improving the yield gain, also improves the sustainability of the system. However, if integrated with utilization/market research the technology adoption rate will be significantly boosted. Additionally, the yield gain will increase because of a decreased market risk, translated in this example by +5% yield for both the varietal technology alone and the variety and management components combined. The total integration of varietal, management, utilization and market research can increase benefits by more than 5 times, compared to varietal improvement alone.

This argument is well illustrated in the case of adoption in Colombia's North Coast, which has been quantified in a study covering six departments producing over 50% of Colombia's cassava (Henry et al., 1993). In the early 80's an Integrated Cassava Project was started in which the first priority was to expand and stabilize cassava markets. This was accomplished by the establishment and development of farmer cooperatives supplying sun dried cassava chips to the fast growing animal feed industry. Concurrently, improved varietal and crop improvement technology components were targeted to these areas.

Table 2 shows that after eight years adoption levels are significantly higher for areas with improved market access and institutional support compared to those areas with only the traditional fresh market. This has been shown for different types of technology components i.e. varietal, management and recommendations that require additional inputs. It must be

noted that this Integrated Project approach through the development of small cassava farmers cooperatives has opened an opportunity for cooperative members to have easier access to credit and therefore allows farmers to adopt components that require additional capital inputs.

Furthermore, econometric analyses estimating elasticities of adoption, show that certain factors like "distance to market" and "cassava cooperative membership" have a significant positive effect on adoption. For example the probability of adoption of optimum planting density and stake treatment, increases by 4.5% and 15%, respectively, as the distance to the new market, cassava drying cooperatives in this case, is reduced by 50%. The adoption of cassava production components since 1984 has resulted in considerable yield gains of 12-25% with respect to traditional market areas. Both yield gain and adoption levels are significantly higher in areas were cassava technology components were integrated (Table 2).

Besides analyzing yield gains and adoption rates, Gottret and Henry estimated the size and distribution of benefits for the Integrated Cassava Project through econometric modeling. Benefits were also analyzed by technology intervention i.e. production (varietal/crop management) versus utilization/market technologies. A summary of the results are shown in Table 3.

Hence, the introduction of a cassava utilization technology in the North coast of Colombia benefitted dry cassava purchasers and processors the most; nonetheless, of greatest importance is the indirect effect of creating an incentive to increase the area planted with cassava and to increase yields through the adoption of improved production technology.

The production response to this incentive provided by the opening of a new market reaped benefits for cassava producers and urban consumers of fresh cassava.

The net benefits to society from the Integrated Cassava Project are estimated at US$ 22 million. If we consider that the total costs of the project were US$ 1.2 million, the total return to the investment was of approximately US$ 18 for every dollar invested.

These results support and reinforce the argument for an integrated approach to the generation of production, processing and marketing technology. In the absence of the widened cassava market, cassava production technology adoption would have been significantly less and the principal beneficiaries would have been fresh cassava consumers, not the small producers to which the technology is targeted. On the other hand, in the absence of production technology, with only processing and marketing innovations, absolute total benefits would have been significantly less and the principal recipients would have been the animal feed factories and, to a lesser extent, processors. The integration of research has been the prime factor in optimizing both absolute benefits and their distribution. As such, the original research objective of targeting benefits to small producers has been fulfilled.

So far both qualitative and quantitative arguments have shown that an integrated cassava research approach will generate higher yield gains and adoption levels, is more sustainable both in a biological/agronomic and a socio-economic sense, and result in significant larger economic pay-offs, compared to varietal development-only research. Moreover, integrated cassava research offers additional advantages. The output from varietal improvement-only research can, in general, be divided into per unit cost reductions and/or yield gains. In an economic sense for benefit estimations, this can be considered as a supply shift. Such a shift in a market with traditional inelastic product demand (and without opportunities to export) this will translate into benefits to consumers only, while producers may even loose (depending on relative elasticities). As was shown in the case of the Integrated Cassava Project in Colombia, utilization and market research activities broadened and stabilized the cassava market (which can be translated as a demand shift), generating two-thirds of the benefits to producers and one-third to consumers (and processors). The integrated research approach therefore offers the possibility for use as a benefit distributing instrument or "equiliser". This is an extremely important factor if research is targeted towards rural development and/or improving the welfare of the rural poor.

CONCLUDING REMARKS

This paper has addressed two fundamental issues: 1. the need for a methodological approach to research planning in order to correctly identify both the constraints to and the opportunities for cassava development and 2. the need for an integrated approach to research implementation as a means of increasing the likelihood that technological innovation are adopted by cassava farmers and processors.

Implicit in the approaches are three underlying organizational requirements that also need to be met for the successful planning and execution of cassava R and D.

These are:

(a) Coordination and collaboration among the various national institutions that undertake cassava related research and development activities;

(b) Interdisciplinary interaction within and among the three principal cassava research areas, namely genetic improvement, crop management and processing and marketing;

(c) Involvement of both extension/development personnel and farmers/processors in the research process, from the setting of research objectives through to technology validation in the field.

CIAT's Cassava Program seeks to play an active role in facilitating and catalysing these institutional interactions. At the regional level, the formation and consolidation of networks

that enhance integration and a free flow of information between institutions and individuals is seen as an important means of ensuring that experiences in one country can be made use of in others. These integrating activities, both at a national and regional levels, accelerate the adoption of novel research methodologies and improved technology components that will ultimately result in greater and better targeted socioeconomic impact.

REFERENCES

Table 1. Estimated benefits from alternative R&D interventions in a hypothetical case of a traditional inelastic market with few production crop alternatives (case 1).

	Without utilization/market research			With utilization/market research integrated		
	% yield gain	% adoption	total benefits	% yield gain	% adoption	total benefits
Varietal technology only	20	10	200	20+5	20	500
Adopted variety with additional management components	30	15	450	30+5	30	1050

Table 2. Cassava technology component adoption[1] and subsequent cassava yields by different level of market influence in the North Coast of Colombia, 1991.

	% of adopters		
	Average[2]	High influence areas[3]	Low influence areas[4]
Technology component			
Variety Venezolana	52.8	87.2	37.2
Variety MP-12	2.2	6.6	0.4
Plant density	26.4	26.9	17.1
Stake selection	8.3	17.0	7.3
Stake size	0.6	1.6	0.5
Mechanization	28.5	36.4	15.6
Herbicides	27.9	47.2	15.1
1992 cassava yields	---------- t/ha ----------		
Intercrop	9.2	9.7	8.7
Monoculture	10.4	13.3	10.8

1 Adoption of components since 1984 only.

2 The average includes an Intermediate reason of influence level that has not been included for simplicity.

3 Strata of cassava producers in areas with cassava drying activities and strong institutional presence.

4 Strata of cassava producers in traditional areas without cassava drying activities and low institutional presence.

Source: Henry et al., 1993.

Table 3. Ex-post economic benefits from the Integrated Cassava Project in Colombia's N. Coast, 1984-91.

Group of society	Benefits from cassava utiliz./mkt technologies (million US$)	%	Benefits from cassava production technologies (million US$)	%	Total benefits from Integrated Project (million US$)	%
Fresh cassava consumers	233	3.4	1,806	12.1	2,039	9.3
Dried cassava users	4,334	62.4	0	0	4,334	19.8
Cassava market agents	-78	-1.1	-584	-3.9	-662	-3.0
Dried cassava processors	1,150	16.6	0	0	1,150	5.3
Cassava producers	1,307	18.8	13,706	91.8	15,013	68.6
Total net benefits to society	6,946	31.7	14,928	68.3	21,874	100

Source: Gottret and Henry, 1992.