REORIENTATION OF RESEARCH AND EXTENSION FOR SMALL FARMERS: REQUIREMENTS FOR EFFECTIVE IMPLEMENTATION

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1. Introduction

The new agricultural policy is directed at improving support for the neglected small scale farm sector and promoting household food security. Research and extension will be reoriented to serve the 95% of farmers who are poor, black, mostly part time and often women farming small areas of land. To this end the government has said it intends to move away from the current paternalistic technology transfer model to a more participatory model of technology generation and dissemination. The new approach will require research programmes to be set in consultation with farmers and not by research institutes as has been the case in the past.

The purpose of this paper is to contribute to the debate on how this change might best be effected and in particular to attempt to highlight some of the key issues that will need to be addressed if a sustainable and effective reorientation of research and extension towards the needs of small scale farmers is to take place in South Africa.

The first part of the paper discusses the nature of the changes that are required and briefly reviews approaches that have been adopted elsewhere to effect a similar shift in research and extension orientation.

The next part of the paper examines the experiences of research and extension systems in the region where a small farmer orientation has been introduced and attempts to highlight the successes and pitfalls experienced by neighbouring countries. The final section attempts to identify some of the key issues that are likely to determine the success of the change process in South Africa.

2. Approaches to Research and Extension for Small Scale Farmers

Deficiencies in the reductionist "transfer of technology" approach

Reductionist research, where discipline specialists based in specialist research institutes investigate specific aspects of crop or livestock production, has been the backbone of technological advance in agriculture and this will need to continue. But technological advances achieved through reductionist research have not served the needs of small resource poor farmers well in South Africa or other developing countries.

For the modern large scale farm sector, the two way transfer of information on farmer production problems to specialist researchers and of research results to farmers has taken place directly or through extension staff and agricultural supply companies. This process has generally worked well for the commercial farm sector in South Africa.

There are a number of reasons why the same process, has not in the past and cannot in the future be expected to work well for the small farm sector.

- The experience of other countries in the region testify to the need to change the approach to technology generation and dissemination to serve the diverse interests of small scale farmers. It has been shown that much of the technology generated by research and transmitted by extension is not relevant to many farmers' priorities or constraints (Collinson, 1982).
- The same communication networks for transfer of information on farmer problems to researchers does not exist. There are many barriers to the effective articulation of small farmer production problems to formal research and extension services or commercial farm input suppliers.
- The sets of small farmer production opportunities, household objectives, managerial capacity and resource endowments are very diverse, even within a single agro-ecological zone. Appropriate messages need to be tailored to these diverse circumstances. Since individual farm specific advice is not as viable as for large scale farming, alternative targeted message development and delivery systems need to be put in place.

New research and extension approaches

In the SADC region two approaches to overcoming the above deficiencies of the reductionist "transfer of technology" model have been widely implemented.

The first is the Training and Visit (T&V) approach. This was promoted by the World Bank to improve the effectiveness and relevance of communication between farmers and researchers through better management of extension geared to the needs of small farmers.

The second is the On Farm Client Oriented Research (OFCOR) approach. This involves procedures to:

- link farmers and researchers directly through diagnosis and researcher-farmer dialogue in order to develop appropriate research agenda;
- develop appropriate targeted messages through on-farm testing and holistic evaluation of technology options.

Although these approaches have the same objective of improving farmer-extension-research communication, they were implemented independently in most cases. T&V was adopted by extension services. OFCOR was introduced into national research systems.

(a) Training and Visit Extension System

The key aspects of the T&V system are: a specialisation of extension staff to deliver only technical information and advice (not inputs or credit); a clear definition of responsibilities, notably between 'subject matter specialists' (SMSs) responsible for the content of technical messages and 'village extension workers' (VEWs) responsible for communicating these to farmers; a strict fortnightly schedule for VEWs to visit identified 'contact farmers' and meet for training by SMSs; a well defined link between research and extension via the SMS (Benor & Baxter, 1984).

(b) On-farm Client Oriented Research

The key aspects of OFCOR are: identification of homogenous target zones on the basis of researchers impressions of the potential for improving productivity; description and understanding of farmers' circumstances in order to group farmers into homogeneous 'recommendation domains', to understand the rationale behind farmers' current practices and to identify problem areas amenable to solution through technical research; identification of factors for experimentation on the basis of assessment of the causes of production problems; conducting experiments on farmers fields; evaluation based on a whole farm perspective and the reactions and assessments of cooperating farmers.

Typically T&V replaced existing extension systems and the changes were introduced nationwide or at a provincial level. OFCOR was often introduced through the establishment of new 'adaptive research units' or on-farm research teams to complement traditional station based disciplinary or commodity research departments.

3. Lessons from experiences elsewhere

This section describes some of the experiences with introducing T&V and OFCOR in other southern African countries. The objective is to highlight some of the practical difficulties involved with making the theoretical T&V and OFCOR models work effectively. Hopefully this will contribute to a clearer understanding of the complexity of the transformation task and provide some insights into what is involved with implementing these approaches.

Organisation of research and extension

The introduction of T&V and OFCOR in Eastern Province, Zambia provides an idea of the way in which these approaches changed the old message development and delivery process.

Before ARPT, the development and delivery of extension messages had followed very much the line of command, as indicated by the black arrows. Extension messages were developed by research at headquarters and then sanctioned by research and extension, also at headquarters. Production guidelines on how to obtain high yields were developed for separate commodities and packaged into recommendations for broad agroecological zones. Field staff were trained at district level by subject matter specialists of the extension service on an *ad hoc* basis, or at district meetings where policy directions, production drives and strategies for combatting pest outbreaks and other problems were passed down from headquarters.

Since the introduction of ARPT, both the development and delivery of extension messages have tended to follow the flow of the grey lines in Figure 1. Two major changes are evident. First, diagnostic activities in OFCOR provide feedback from farmers to researchers. Second, extension messages are developed, theoretically at least, at the provincial level in a forum which involves field extension staff, subject matter extension specialists and on-farm researchers.

This type of change in structure and information flows have been put in place in most research and extension services in southern Africa over the last decade or so. How successful have they been in effecting feedback of information on farmer problems to research and in transferring relevant messages to farmers?

Technology development

Generally OFCOR teams have experienced no difficulty in identifying clear sets of research opportunities from initial diagnostic studies. Even for well researched crops like maize, where a strong technical knowledge base exists, technologies for commercial farmers needed adaptation to meet small farmer needs. Adaptive research topics specific to small scale farmer needs which were readily identified included germplasm, late planting, tillage, population density, fertiliser management, weed control and mixed cropping (Waddington & Kunjeku, 1989; Shumba, 1988, 1989; Waterworth & Muwamba, 1989; Waterworth, 1989)

For crops other than maize or for marginal areas adaptive research opportunities have often been limited by lack of existing technology and diagnostic studies have indicated the need for applied rather than adaptive research (e.g. grain crops or varieties suitable for intercropping with legumes or tolerant of weeds; plant population densities for semi-arid areas; tillage for sorghum establishment in semi-arid areas; planting guidelines on drying seedbeds; labour saving fertilizer management on sandy soils).

Moving beyond the identification of research issues to influencing applied research agenda has been more difficult. The feedback of information to bring clients' needs to bear on research priority setting was assessed as weak in half the cases examined by ISNAR (Merrill-Sands and McAllister, 1988). One of the main explanations of this failure is at the same time one of the strengths of OFCOR: location specificity. Because OFCOR stresses the need to develop technologies for well-defined groups of farmers, it tend to be conducted in an isolated fashion. The frequently poor communications between these teams and the larger institution means that it has cut itself off from the possibility of helping to set research priorities. This will be a particular problem in South Africa: experienced staff in well established research institutes will not easily adjust their programmes on the basis of the results of diagnostic work conducted by scattered OFCOR research teams comprised of junior, less qualified staff. Serious attention will need to be given to reporting collating and synthesizing local specific OFCOR results so that they become relevant at the district and provincial levels and to ensuring that directors of research institutes take account of these results in setting their research agenda.

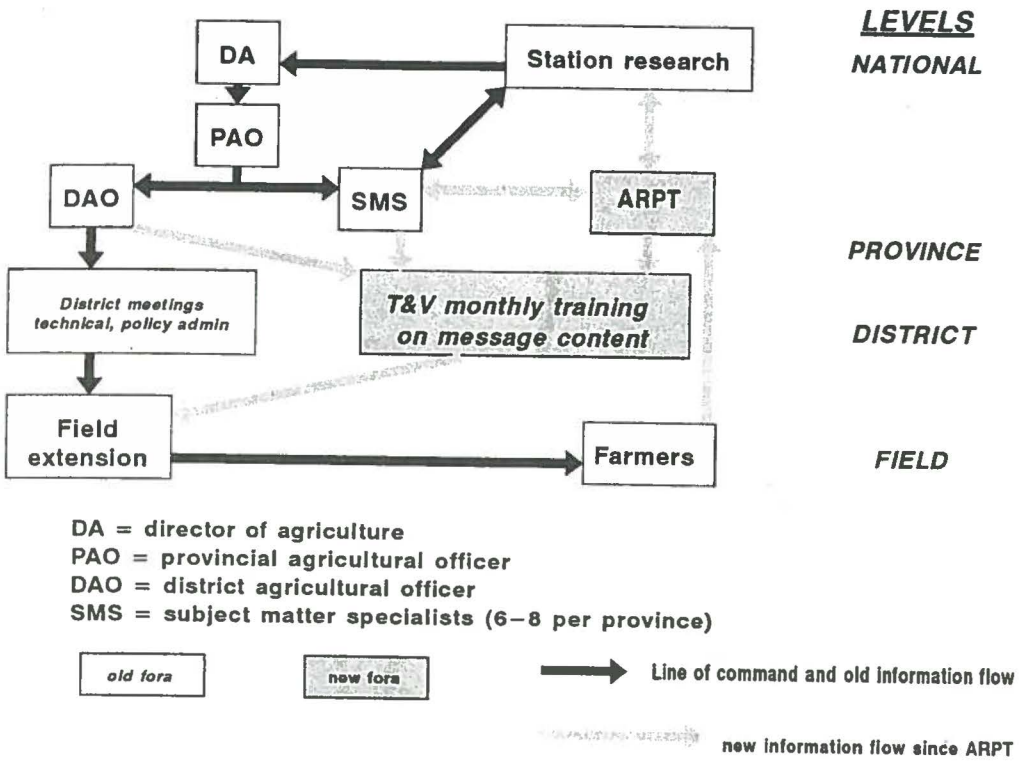

Figure 1: Zambia research and extension structure

Technology transfer

Moving from identified research topics to adoptable extension messages has also not been as easy as expected with OFCOR and T&V models in place. A general analysis of the outcome of on-farm work (on maize as well as cotton, sorghum, beans and sunflower) in Swaziland, Zambia and Zimbabwe gave the results presented in Figure 2. This analysis shows about one third of the original research themes formulated from identified opportunities resulted in technologies being adopted. Most of these were adopted only partially or by limited number of farmers (less than 100, generally representing a proportion of the farmers cooperating in the research).

In many cases losses before recommendations being produced are due to poor planning and implementation of OFCOR programmes. Deficiencies have included the following:

- Superficial diagnosis of problems and causes. Often this was based on a few days of informal surveying in the field, resulting from a perceived urgency to get to the trial stage. This has led to some inappropriate trials, such as stalk bending to alleviate cobrot, which was not a significant problem in most years. Inadequate attention has been paid to agronomic aspects of diagnosis, to identifying which farmers have a given problem and to targeting of solutions.
- Poor implementation of trials. Many OFCOR programmes suffer from inadequate attention to selection of farmers and field sites and training of field assistants, and lack of supervision of experiments. This has often been caused by a tendency to overextend the numbers of trials planned beyond the capacity of researchers to visit and manage them. Poor implementation has led to doubts about the validity of the results of many on-farm experiments.
- Inadequate analysis and interpretation of trial results in relation to the implications for farmers and planning of the next cycle of trials. This has often been due to lack of a clear idea about the purpose of the trial or its place in the overall research programme. A common experience has been that the initial diagnosis fixes the content of trial programmes for many years.
- Lack of genuine farmer participation. For example Biggs (1989) assessed half of 25 OFCOR programmes he examined as having only a consultative type of communication, whereby scientists consulted with farmers about their problems and then developed solutions. This is contrasted with two other types of possible farmer participation modes: (a) *collaborative*, where scientists and farmers collaborate as partners in the research process and, (b) *collegial*, where scientists work to strengthen farmers' informal research and development systems.
- All these deficiencies have been exacerbated by a high turnover of donor funded expatriate staff as well as national staff (many to overseas training). There has also been little good documentation of research rationale and results to mitigate the high turnover of staff.

About 50% of the losses between identified opportunities and recommendations in Figure 2 can be attributed to these various implementation deficiencies. This highlights the importance of good training in the practical implementation of diagnostic and on-farm trial procedures.

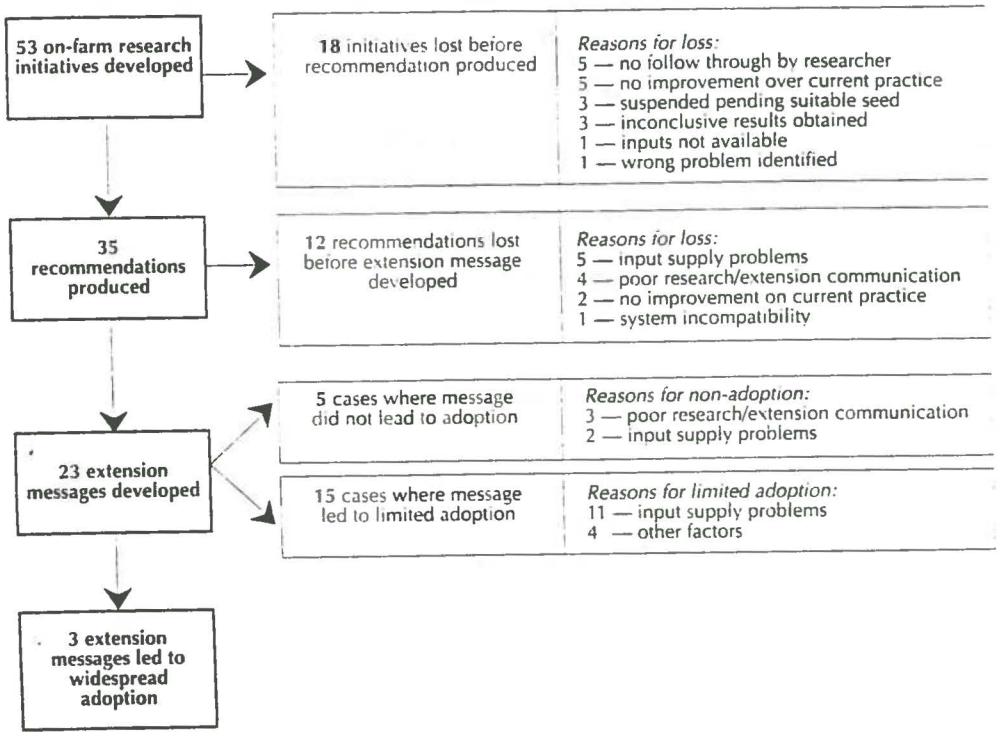

Figure 2: Analysis of the progression from on-farm research initiatives to farmer adoption, in Swaziland, Zambia and Zimbabwe

However even where OFCOR has been well implemented and research recommendations have resulted, translation of these recommendations into extension messages that are widely adopted has not been straightforward. Difficulties have arisen because of the type of recommendations coming out of OFCOR type work, which differ from the standard "best husbandry" packages that extension workers are familiar with.

Some of the outputs generated by OFCOR, such as better adapted varieties (shorter season maizes for late planting) or recommendations adjusted for specific agro-ecological locations pose no real conflict with this traditional extension model.

But many of the outputs generated by OFCOR imply recommendations that are either:

- sub-optimal, with input levels below and/or management less intensive than those shown to give good returns at high yield levels.
- conditional on natural, economic or seasonal circumstances

Sub-optimal recommendations take account of farmers being unable to manage all factors of production at optimum levels, because of resource constraints or priority conflicts. In these cases recommendations are not concerned with "the best way" to grow a crop, but with reducing management conflicts or improving management or resource use within the given constraints. For example, a sub-optimal recommendation involving delayed application of basal fertilizer to maize was developed in Central Province, Zambia. Researchers found that farmers' maize management was being compromised due to labour shortages. Farmers were delaying weeding until the crop was about 70cm tall, at which time they combined a single hand weeding with topdress fertilizer. On-farm research results showed that earlier weeding (at 20cm) increased yields by 17% and that a further yield increase was obtained by bringing forward the timing of topdressing as well. Since the timing of basal fertilizer had no significant effect on yield, it was concluded that delaying basal fertilizer application and making a combined (basal and topdress) fertilizer application in conjunction with weeding at 20cm would increase yields over current practice and reduce labour requirements by six mandays per hectare during peak periods for labour (Waterworth & Muwamba, 1989). Three seasons of trials confirmed the economic benefit of the combined fertilizer and early weeding practice.

However extension misinterpreted the results of these trials. In the extension demonstrations set up to verify the trial results and elicit farmer response over the next two years, basal fertilizer was applied at planting (as currently recommended), thus missing the additional labour saving of mixing basal and topdressing. Farmers were not enthusiastic about the demonstrations and recommendations were never issued on these OFCOR trial findings.

Conditional type results seem to be equally difficult for extension to digest. OFCOR results in Luapula Province, Zambia led to the conclusion that maize variety recommendations should be conditional on

whether fertilizer was applied or not. Consistent on-farm research results indicated the superiority of an open pollinated improved variety over hybrids when no fertilizer was applied (Waterworth & Muwamba, 1989). However extension messages concerning maize varieties and fertilizer rates only related to hybrids and recommended 60 Kg N ha^{-1}. The option of using no fertilizer and non-hybrids was not included.

These examples illustrate the problem that extension staff had with handling management based on-farm research findings that do not conform to accepted "technical" ideals. Acceptance of the utility of sub-optimal and conditional recommendations tends to conflict with the technical training and in-service experience of most extension and agricultural development officers and requires new skills in making conditional judgements about what input levels or management practices are appropriate for which farmers.

This training element was missing in many T&V programmes where the emphasis was on the management process rather than message content. In some instances the message delivery became over rigid. For example in Swaziland standard messages were bundled up and delivered in an exact order and timing, regardless of modifications made by farmers to account for rainfall patterns or labour constraints. "Thus extension workers sometimes found themselves telling farmers who had not yet planted that it was time to topdress with nitrogen" (Low, Seubert & Waterworth, 1991).

4. Making the change work: implementation issues

There are two distinct but related issues that need to be successfully addressed if the concept of changing from a 'top down' to a 'bottom up' system of technology generation and dissemination is to be turned into reality and produce effective results. The first issue relates to the practice of farmer oriented research and extension: how to ensure that it is done well and effectively. The second relates to linkages: many sets of actors need to be involved and the flow of information between them needs to be regular, relevant and understood.

The practice of farmer oriented research and extension

The change from a technology based to a small farmer based orientation involves a change in perception, outlook and attitude as well as the acquisition of new skills. As the experience has shown in neighbouring countries, these changes do not come about easily.

The small farmer oriented approach implies a fundamental change from the technically oriented research and extension philosophy. It is important to realise that those who have been involved with highly successful (but limited) impact of the technology based approach will find it difficult to accept that a reorientation is needed or will generate better results. In Malawi, for example, there was substantial initial resistance from commodity research programmes to the development of adaptive research teams. The idea that adaptive teams had a role to play in setting research agenda for commodity teams was not easily accepted. The commodity teams wanted adaptive teams to be restricted to testing their station generated technologies on farmers fields in different agro-ecological conditions. The Communal Areas Research Trials (CART) programme in Zimbabwe was conceived in very much the same light.

The training and deployment of competent, interdisciplinary field adaptive research and/or extension teams to diagnose farmer problems and identify potential technical solutions is not sufficient. The role that these teams play in feeding back information on farmers needs and problems to research and extension planners needs to be recognised and accepted by staff at research institutes, by extension directors, by agricultural departments, by development corporations and the like. This implies the need for reorientation in thinking and perspectives at all levels and across a broad range of institutions.

At the same time it is essential for field practitioners to have good practical training in how to diagnose farmer problems, conduct participatory research and extension and how to conduct trials on farmers fields. Poor implementation of OFCOR and T&V type approaches provide potent ammunition for proponents of the traditional transfer to technology model.

OFCOR and T&V are easily implemented badly and often have been within government research and extension institutions where established organisational cultures change slowly. In particular government departments undertaking OFCOR and T&V activities have not been good at participating closely with farmers.

In the South African context there must be a strong doubt as to whether departments of agriculture and research can change sufficiently quickly to support genuine small farmer participatory activities of a collaborative or collegial type in the medium term. It has been suggested that NGOs have a comparative advantage in involving farmers in the research and development process compared with government departments. Because of their greater flexibility of operation, they have been able to develop innovative participatory methodology for learning from farmers, they have addressed technology gaps, especially those requiring interdisciplinary teamwork, they have focused on poorer groups in marginal areas, they have been able to work with communities and have promoted the development of rural groups and community based organisations (CBOs) (Farrington & Biggs, 1990).

In rural South Africa NGOs have been active in promoting CBOs over recent years and the opportunity exists to make better use of the experience and expertise of NGOs than neighbouring countries have done in the promotion of farmer participation in research and development. However greater NGO involvement raises the issues of technical expertise available to NGOs, the relationship between NGOs and government departments and the coordination of different NGOs and government departments working in the same district. Bebbington and Farrington (1992) suggest that the coordination of NGO activity should be a role for local government. They also suggest that agricultural research and extension departments provide technical support to NGO projects, possibly subcontracting field research (diagnostic surveys, on-farm trials, demonstrations) to NGOs. Such a partnership may be a precursor to a regional-level agricultural technology development committee involving government research and extension organisations, farmer organisations and NGOs,

including university departments and commercial input supply companies.

Linkages and information flows

While the introduction of OFCOR and T&V approaches have blurred the distinction between research and extension, they have not obviated the need to ensure the development of good information flows through the technology generation and dissemination continuum. In Swaziland and Zambia miscommunication between OFCOR and T&V teams led to the development of mechanisms for improving information flows (Low, Seubert & Waterworth, 1991). In Zambia formal liaison structures, information formats and extension training have been used to enhance research-extension communication (Waterworth, 1990). In Swaziland emphasis has been placed on packaging research information in ways that are useful to extension workers (Seubert, 1989).

In South Africa it will be necessary to ensure effective communication between such diverse institutions such as research institutes, provincial government research and extension organisations, NGOs, university departments and commercial input suppliers. The task will be a formidable one and should not be underestimated as it has been by earlier OFCOR and T&V programmes, which assumed that the new approaches themselves would facilitate research-extension-farmer links. Much can be learned from neighbouring country experiences in overcoming communication problems. These include efforts to develop joint research-extension planning and implementation of field work such as Zimbabwe's Committee for On-farm Research (COFRE) (Fenner & Shumba, 1989), Lesotho's experience with implementing a collaborative research and extension programme (Low & Mokheseng, 1989) and Botswana's use of farmer groups to bring research and extension workers together (Norman et al, 1988).

5. Conclusion

Key lessons that emerge from the experiences of neighbouring counties in implementing research and extension approaches aimed at meeting the needs of small scale farmers can be summarised in the three words: commitment, competence, communication.

A genuine commitment to change from a paternalistic top down transfer of technology to a farmer problem oriented approach to research and extension is needed at all levels. This commitment needs to go beyond the establishment of field OFCOR and T&V type teams. The change of perspective needs to accepted and supported by research and extension administrators.

Such a change will inevitably take time to achieve and in the meantime it is essential that the case for a change in perspective is not weakened by poor field implementation. Maximum use should be made of the community level experience of the NGO sector in South Africa and a premium needs to be placed on good field level training by experienced practitioners.

Finally the technology generation and dissemination continuum needs to be well linked and integrated, particularly at the local level. Each Provincial agricultural department will have to work out linkage mechanisms best suited to its own circumstances.

There is no question that research and extension in South Africa needs to be reoriented if the needs of the small farmers are to be better served than they have been in the past. The issue is how this might best be done. South Africa has the advantage that it is setting off on this task a decade after its neighbours and stands to gain from those experiences. Many innovative approaches to overcoming the problems inherent in making such a change work effectively are contained in those experiences. The experience to date suggest the need to be realistic about expectations in the short term. In the longer term a shift in research and extension orientation to the needs of small farmers will have a significant welfare and production impact. But to achieve the reorientation and reap its benefits requires a broad based commitment, competent field implementation and effective communication between the many actors who have a role to play in the generation and dissemination of appropriate technology to meet the needs of the hitherto neglected small farmer in South Africa.

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