ARNAB: Network Aspirations

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Summary

Research networks are desirable and can greatly enhance research progress and application of results. Networks can be viable when they are formed by scientists who have mutual desire and trust amongst themselves and are working on a common problem. Within the network activities, scientists must gain something, e.g., skills, knowledge, literature, access to research and analytical facilities. These gains help to sustain interest. Network members have also to share responsibilities and therefore contribute to the network. Through complementary research programs and exchange of information, research progress can be greatly enhanced. A true network of national scientists avoids the risk, inherent in more centralized forms of regional program, of domination of national programs.

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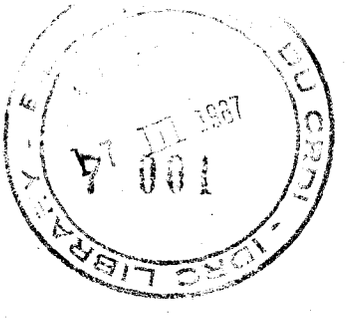

International Development Research Centre

ARNAB: NETWORK ASPIRATIONS

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INTRODUCTION

In this short paper, a few issues on organizational aspects of a network will be raised and reference will be made to ARNAB. As literature on networks is very limited, the information contained in papers by Arnon (1968) Plucknett and Smith (1984) and Toledo, Li-Pun and Pizzaro (1984) has been used exhaustively. The review contains a definition of a network, and research program activities. A short account of the history of ARNAB has been included for the benefit of non-members.

DEFINITION OF NETWORK

To-date, there is no specific definition of a research network. The word network is borrowed from fabric with cross-linkages typified by a cob-web. Unlike the cob-web, there are no physical linkages in a research network and the linkages are not rigidly regimented. A description such as "Cluster of scientists or institutions linked together by common interest to work independently and inter-dependently on common identified shared problems or potentials". The cluster of scientists may be within the same country or may be from different countries and having certain problems or research programs in common irrespective of their locations. In the case of ARNAB, a group of scientists based in different countries in various types of institutions are conducting research on crop residues and by-products utilization as livestock feeds. The definition above gives the components of scientists, problems and research programs in a network, further a network must respond to the reactions of the users of the results of the research program. A schematic representation of a hypothetical network is given in figure 1.

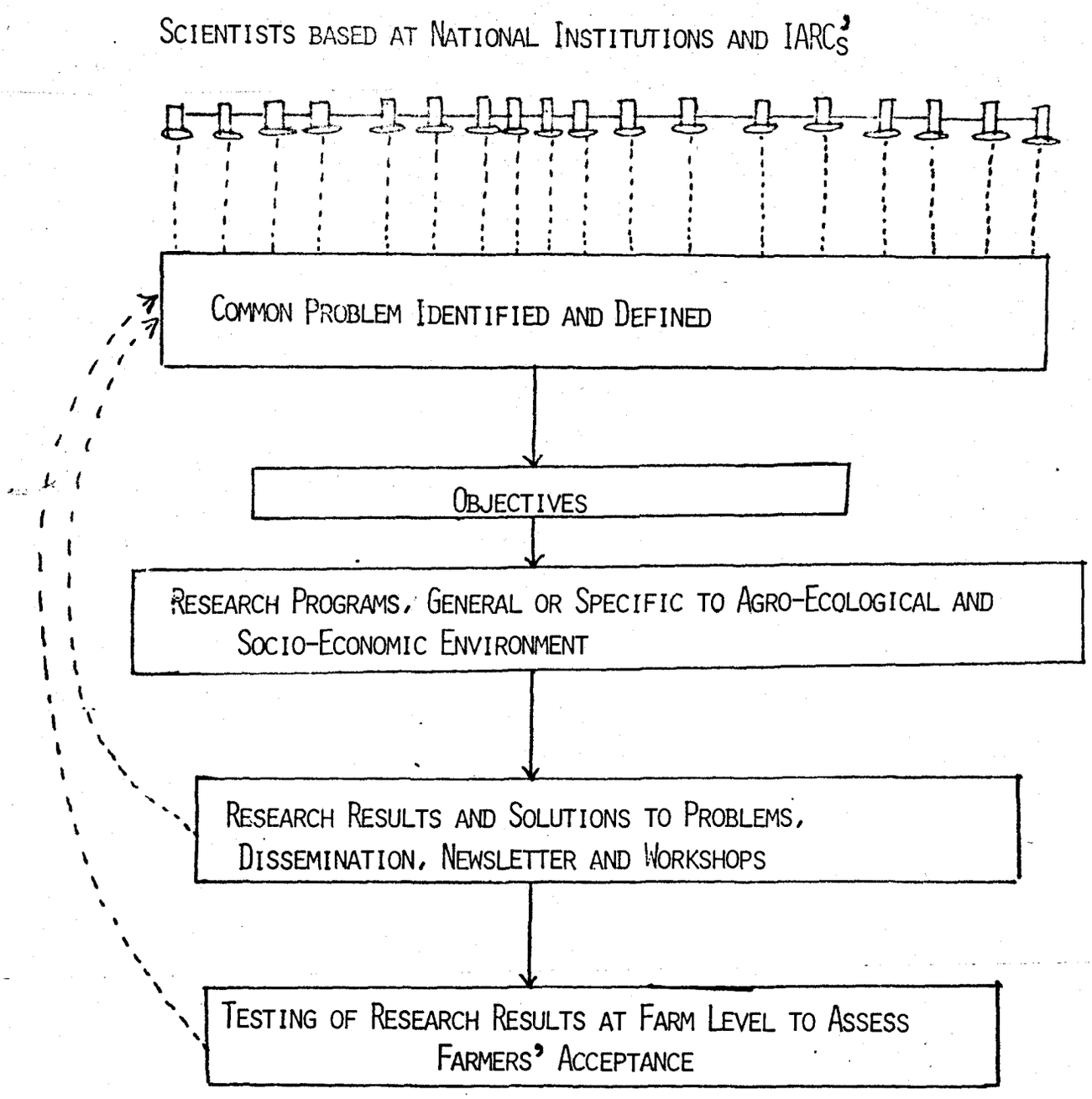

Figure 1. Schematic representation of network and how it functions.

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The components of a network deserve some discusion.

SCIENTISTS

Networks are composed of people and in the case of a research network, these are scientists in a specified discipline or interrelated disciplines. The nature of research is such that specialists are the ones who can contribute ideas in research programs and also execute research programs. On the other hand, one has to bear in mind that, as the ultimate goal is to transfer technology to agents of change (extension workers) and users (farmers), the membership may include anybody who has interest in receiving newsletters. In the case of ARNAB, membership is open to any researcher in Africa. However, as networks set themselves to do certain tasks, a pre-requisite is that scientists should have the feeling of the need to cooperate. The need to cooperate arises from one or more of the following:

Desire for cooperation

- Desire to remove isolation and felt need for cooperation;
- desire to learn from others working in the same area;
- to have access to literature, computer facilities, germplasm, etc., which are available in large laboratories;
- desire to acquire specific skills among young scientists;
- desire to contribute to other research programs within the country and outside;
- to form a forum through which scientists can communicate with policy makers and probably have an impact on policies on development activities; and,
- likelihood of getting financial support.

From the above, it is apparent that scientists have to see potential gains before forming or joining a network. During theoperation of the network members have to benefit to sustain their interests.

COMMON PROBLEMS OR POTENTIALS (Figure 2)

Agricultural scientists have to understand the agricultural industry to be able to identify the problems and choose among them the most limiting factors (problems) to be tackled first as in many cases it is not possible to study all the problems at once. In the case of livestock industries in Africa, the common problems are:

Common problems

i) Social economic attitudes of the farmers;

ii) prevalence of diseases - east coast fever, trypanosomiasis, blackleg, anthrax, foot-and-mouth disease;

iii) inadequate feed supplies. Seasonal availability of feeds and seasonal variation in feed quality;

iv) poor marketing and distribution;

v) shortage of scientific and technical manpower;

vi) inadequate mobilization of resources and sometimes disuse (e.g. overgrazing);

vii) external market restrictions, quarantines and political;

viii) low genetic potential.

From the list one should rationalize and choose among these. Further, the application of law of diminishing returns is cost effective. Initially, relatively simple and empirical experimentation may give spectacular results; however, a stage is reached when further progress is dependent on a greater effort.

Example: Milk production improvement through cross-breeding and supplementary concentrate feeding.

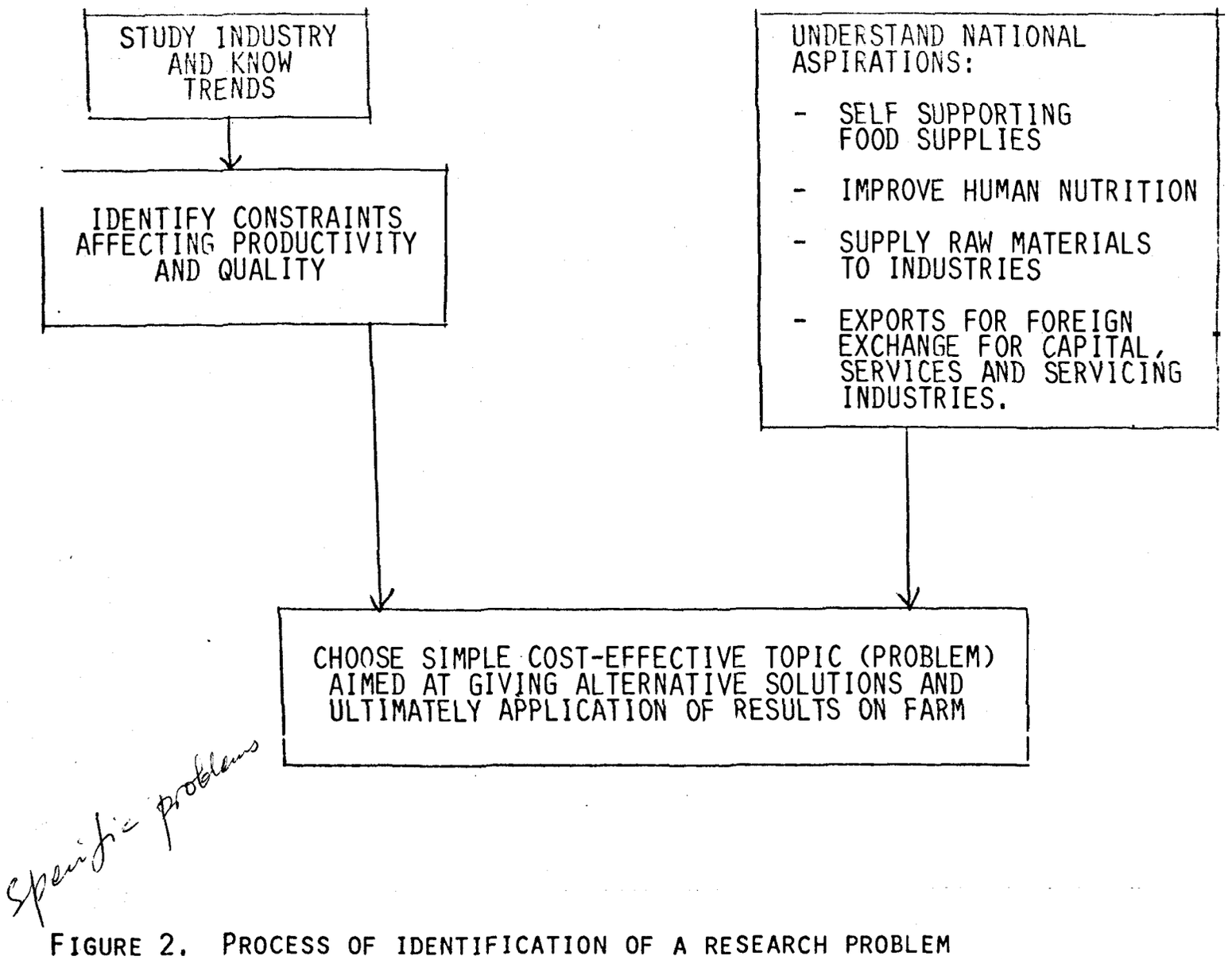

FIGURE 2. PROCESS OF IDENTIFICATION OF A RESEARCH PROBLEM

The identified problem must be aimed at giving alternative solutions to the problems of the farming community and the needs of the country as a whole.

Typical national aspirations are:

- Self supporting in food supplies;
- improvement of nutritional standards;
- supply of raw materials to national industries;
- export crop/livestock products to earn foreign exchange for capital investment, sustain social services or sustain agricultural industry.

As expected, scientists forming a network have to define the problem or potential which has been identified. In the case of ARNAB, it is recognized that crop residues and agro-industrial by-products contribute significantly to animal feed supplies but the present practices of

feeding them in situ is inefficient and wasteful. It is also recognized that in order for the studies to be of relevance to development, it is recommended that studies should be conducted within well-defined production systems to assure relevance and applicability of the research by farmers. The problem is well defined and the diversity of natural and socio-economic resources are being taken into account.

Other examples of common problems or potentials are disease outbreaks in livestock or crops, development of hybrid maize, introduction and evaluation of forage species and identification of trypano-tolerant cattle strains.

In addition to the identification of a common problem or potential, the broad objectives and specific objectives have to be developed. In the case of ARNAB, these were broadly laid out in 1981 Dakar Workshop ... (Appendix 1) and also specifically mentioned in the ILCA-By-Products project and national projects (Egypt, Sudan, Tanzania, Nigeria, Cameroon, Senegal and Cyprus).

RESEARCH PROGRAMS

As a follow-up to the developed objectives, research programs should be developed to fulfil the objectives laid out, taking into consideration the available infrastructure and facilities, similarities and dissimilarities in agro-ecological zones and socio-economic environments. The target group has to be characterized by the respective national researchers. Within the context of research network, the common research constraints have to be identified. In the specific field of by-products utilization, the following research constraints are outstanding:

(a) manpower shortages and/or high turnover rates of staff, both professional and technical;

(b) scarcity of literature;

(c) isolation of scientists;

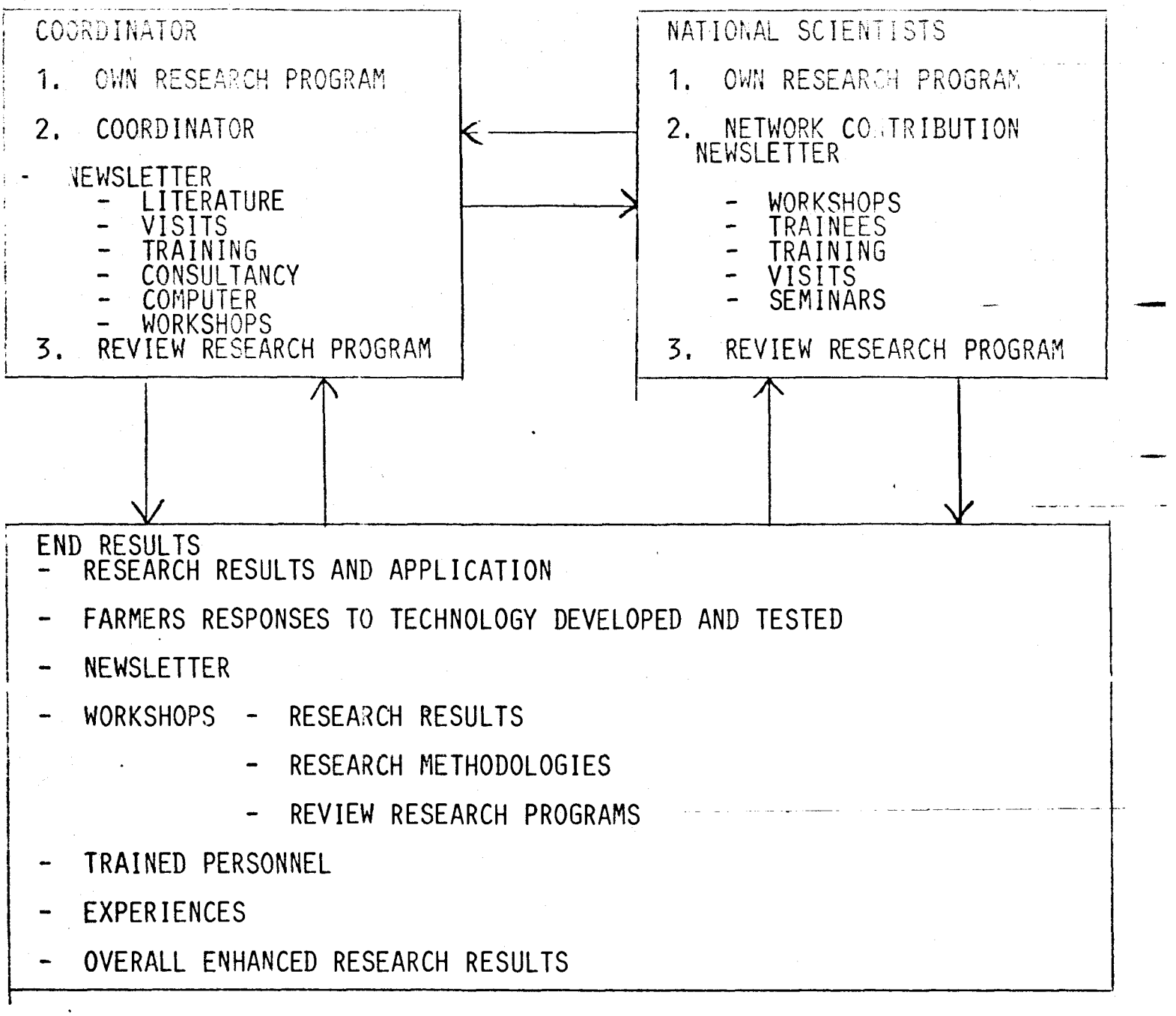

FIGURE 3. SHARED RESPONSIBILITIES IN A NETWORK AND DYNAMISM OF NETWORK ACTIVITIES

(d) limited infrastructure;

(e) scarcity of finance to support recurrent expenses;

(f) weak links between research and extension; and,

(g) difficulty in forming multidisciplinary research teams.

With these problems in mind, the two workshops (ILCA/AAASA 1980 and ILCA/FAO, 1981) recommended that ILCA should undertake the responsibility of coordination of a network. In this role, ILCA would alleviate some of the above constraints:

- train technical staff and young scientists;
- make literature available through tables of contents of journals, reprints, books and literature search;
- reduce isolation through a newsletter;
- make available a consultant socio-economist to biology-biased teams.

Other activities of ILCA as a coordinating institution are spelt out in the project document (Appendix II). In order to achieve these effectively, ILCA has to work with ARNAB members. This cooperation is pivotal in determining the success of a network. The pre-requisites for collaborative research have earlier been listed. Shared responsibilities is desirable in a network and similarly is the flow of information through newsletters. Workshops are also important in fast dissemination of research results and offer opportunities for reviewing research methodologies and research programs. Figure 3 is a hypothetical model of shared responsibilities in a network and the flow of information and feedback.

It is certainly difficult to judge the feelings of people and similarly the personal interrelationships. However, it is possible to work for improved interrelationships. IDRC has to an extent financially supported ARNAB activities in form of capital items, recurrent expenses and workshops. It is hoped that IDRC's financial support has been catalytic.

Details on specific planned activities in the various project are in the respective documents. They have certain things in common. Let me at this stage review the overall benefits that can be accrued in network activities:

- Enhances dissemination of research results through newsletters and annual workshops in comparison to journals which take between one year to several years for results to be published;

- provides forums for exchange of information and experiences and feedback;

- saves time and funds through avoiding duplication and running complementary national programs. Therefore research progress is greatly acceleratted;

- makes accessible facilties unavailable in national institutions;

- enhances the development of research methodologies through testing and resolving methodological difficulties;

- makes it easier for scientists to extrapolate results if experimental methodologies are similar;

- facilitates exchange of potentially useful germplasm;

- catalytically stimulates research activities;

- offers training opportunities for scientists and technicians;

- small sized countries with limited capacities can participate and benefit from broad-based research programs;

- network provides a forum for influencing policies;

- provides a media to IARC's to develop contacts with national programs and transfer of technology.

While networks have the above benefits, networks are also beset with basic problems of:

- Danger of domination by IARC or strong members of network resulting in waning of interest by participating scientists conceivably funding agencies can also dominate.
- networks tend to isolate themselves into "groups" or "subgroups". Researchers not participating in network can become isolated;

- networks formed without consultations with national scientists usually fail to get feedbacks;

- national programs may suffer if there are too many network programs;

- inflexible experimental designs stir complaints;

- some countries insist on government representation in networks;

- changes in leadership are sometimes necessary but detrimental to networks due to lack of continuity and time needed to cultivate confidence;

- scientists are unfamiliar with network activities (contributions into newsletter and methodological development).

In order to avoid these risks, the pre-requisite of felt needs for cooperation must exist or be cultivated before the formation of a network. Imposed networks are top down programs and should be avoided. Consultations must be made on the mode of the network and the appointment of coordinating agency. As networks are expected to promote participation, the coordinating institution should accept the responsibility as an equal partner. Built in participatory roles of members and flexibility, permit members to contribute technically and also in the evaluation and review of the network may take time and it is worth it but it should not take too long as interest among scientists may wane with time.

Notwithstanding these drawbacks, networks have proven their benefits in many agricultural programs, notably USDA research programs, IRRI's rice program and CIMMYT's cereal program.

HISTORY OF ARNAB

The beginnings of ARNAB can be traced back to the workshop organized by ILCA and the Association for the Advancement of Agricultural Sciences in Africa (AAASA) in Douala, Cameroon in 1980. Fifty-two African scientists attended the meeting and unanimously recommended that ILCA should initiate the formation of an African Research Network for Agricultural By-products of scientists involved in research on crop residues for feeding to livestock. The recommendation was implemented by ILCA in the following year 1981 with the launching of a newsletter and visits to national institutions. In 1981 FAO and ILCA jointly organized a workshop in Dakar, Senegal on crop residues and agro-industrial by-products in animal feeding from 21 to 25 September, 1981. About twenty scientists from Africa attended the workshop. The scientists went at length in drawing out the recommendations and in particular on the African Network. Part of the recommendations are given in Appendix II. These show clearly that African scientists have all along been aware of the need for collaborative research programs. Other workshops on utilization of by-products within Africa were held in Tanzania in 1981; Kenya in 1982 and Egypt in 1983. In the 1981 and 1982 meetings the need for collaborative research was re-emphasized with a goal of enhancing research progress and application of results.

Based on the 1981 FAO/ILCA workshop, FAO and ILCA organized an Expert Consultation in 1984, and the major objective was to develop guidelines for research methodologies on utilization of crop residues and agro-industrial by-products. The majority of the ARNAB nucleus members attended this expert consultation. During the meeting time was set aside for ARNAB agenda. ILCA's proposal for funding by IDRC was discussed and the final project document took the points raised by the members. This week's meeting is essentially a follow-up of the one held last year.

In summary, ARNAB has evolved in the last five years and is mature enough to carry out collaborative research (Figure 2). The time of evolution has not been without hitches and it is my hope that we will resolve these in this workshop.

On the research programs, the different country research programs are at different stages. We should reckon that a number of African scientists have worked in this area for more than a decade while some are just beginning.

EVALUATION

We have probably reached a stage when we may wish to candidly evaluate ARNAB's organization and activities and plan for future activities.

References

1. Arnon, I. 1968. Organization and Administration of Agricultural Research. Elsevier Publishing Company Ltd. New York.

2. FAO, 1981. Crop residues and agro-industrial by-products in animal feeding. Proceedings of FAO/ILCA workshop held in Dakar, Senegal, 21-25 September, 1982.

3. Plucknett, D.L. and Smith, N.J.H. 1984. Networking in International Agricultural Research. Science 225:989-993.

4. Toledo, J.M., Li-Pun, H.H. and Pizzaro, E.A. 1984. The Network Approach in Pasture Research: Tropical American Experience. In Proceedings of Workshop on Pasture Improvement in Eastern and Southern Africa, IDRC.

DEVELOPMENTS OF ARNAB

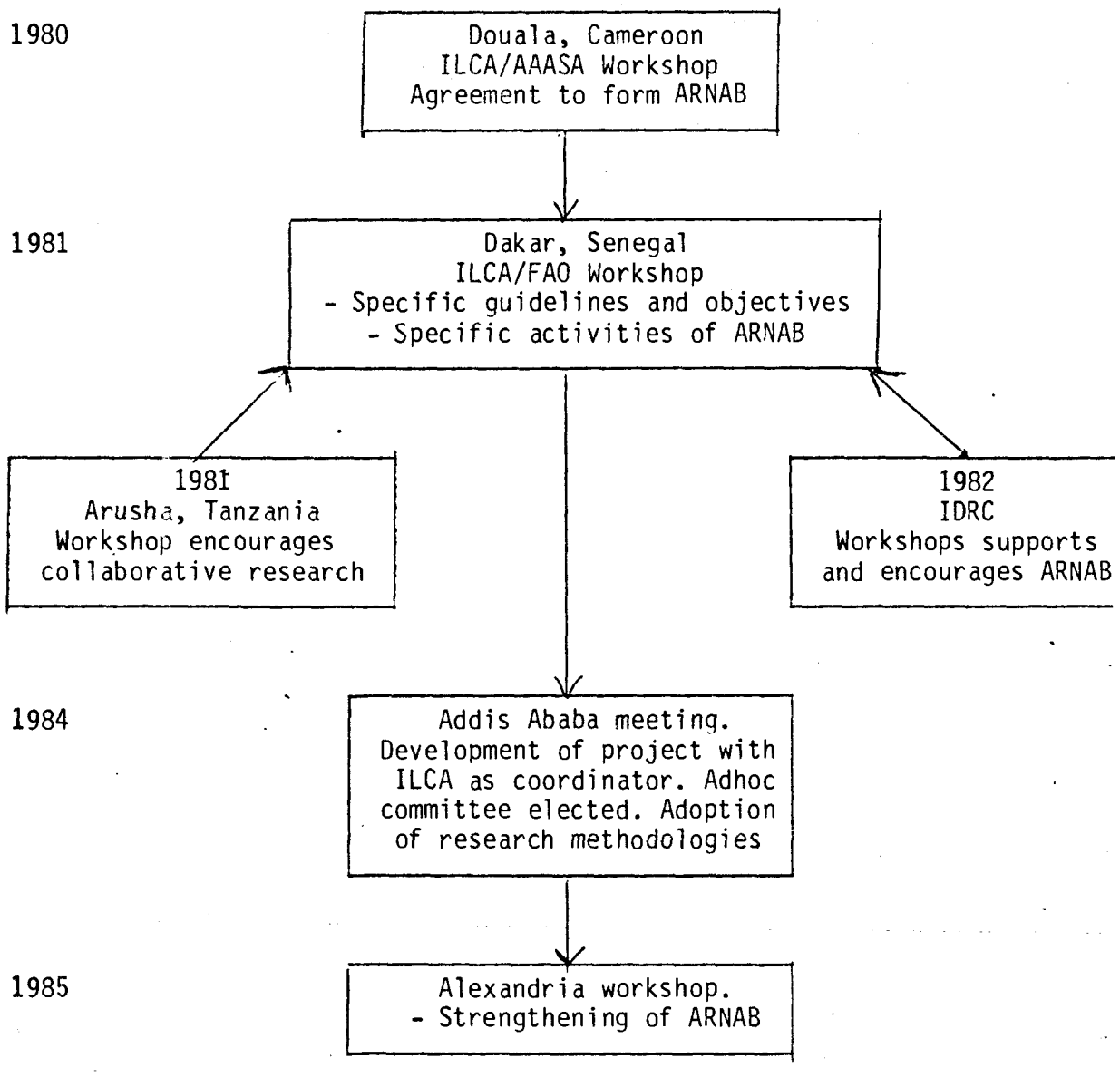

FIGURE 4

APPENDIX 1

AFRICAN NETWORK

Extension of the existing network. The participants were grateful for the current efforts of FAO and more recently for ILCA's collaboration in setting up a research network to deal with the utilization of crop residues and agro-industrial by-products in Africa. They recognized the need to establish programs in most African countries which would contribute to reducing the cost of feed to ruminant stock while removing the pollution caused by some waste products and increasing animal production for local consumption. In view of the similarity of agro-industrial by-products and crop residues in African countries and the similarity of the ecology and animal types, it is essential there should be close collaboration among these programs. In this respect, every effort must be made to extend the current network to include all the African countries in which work on this subject is known to be in progress.

The participants recommended that ILCA, in collaboration with FAO, undertake to organize the extension of the network to all African countries and ensure the leadership.

Gathering information. The first priority for all the member countries of the network should be to gather information on crop residues and by-products and this should include:

a) an inventory consisting of a rapid approximation based on the primary product (as estimated in official statistics) and the rate of extraction (determined by means of simple experiments), the figures being in terms of dry matter;

b) a record of nutritive value using existing basic data (not calculated values such as DCP or FU);

c) research based on an appropriate methodology to obtain additional data on the nutritive value (see Annex);

d) description of the seasonality of production;

e) location of the by-product and crop residues versus the location of livestock;

f) alternative uses and opportunity prices for existing and future projects;

g) price of fuel (diesel for transport, liquid gas, charcoal, wood, electricity);

h) cost of transport.

Specific activities of the network. As regards the specific activities of the network, the following points must be concentrated upon:

- identifying scientists engaged in research work in these fields;
- encouraging and interdisciplinary approach to solve problems and develop farming systems;
- encouraging scientists in their work through the exchange of information; this could take the form of correspondence, newsletters, biennial workshops (bilingual);
- assisting such scientists in their work by short visits by the network coordinator and by high-level consultants with experience in tropical countries, to ensure the quality of the work being done and to ensure that the African countries benefit from the experience of other countries;
- supplying minor items of equipment when necessary for specific studies;
- assisting the members of the network to publish their research results in the ILCA newsletter and especially in international journals. Few journals encourage the publication of scientific articles from developing countries. It is therefore recommended that publication of a specialized trilingual journal on the subject be encouraged. The journal Tropical Animal Production which is already published in Spanish and English could be the ideal medium for such an initiative.

ORGANIZATION OF THE RESEARCH

Livestock production systems. It is recommended that all studies involving residues and by-products be geared to livestock production systems, bearing in mind that these systems must be applicable to small-farming conditions.

Small-farm units (such as the ILCA farms) must be set up integrating plant, livestock and energy production, using natural resources and recycling under different ecological and sociological conditions. They should be done at research level and by selected farmers.

These systems should incorporate monogastric species as well as ruminants and must aim at finding alternatives to cereal grains. The participants noted the work being carried out along these lines in some countries (such as Ghana and Tanzania). When developing this strategy, emphasis must be placed on non-industrial farm-yard systems including species such as ducks, turkeys, rabbits and even fish.

Special attention is drawn to the need to encourage the study and use of animals for draught purposes.

Establishment of guidelines for the assessment of food value. It was recommended that an expert consultation be organized to establish guidelines for research on crop residues and by-products. This consultation should produce a booklet describing detailed methodology and compiling known appropriate methods of analysis.

UTILIZATION OF CROP RESIDUES AND BY-PRODUCTS AT COUNTRY LEVEL

Definition of a policy. The workshop recommended that each African government define a policy regarding utilization of the most valuable by-products such as molasses and oil cakes, banning export of these feeds when large quantities of cereals are imported. In this respect, it is recommended to feed "more cakes and less grains".

Site of utilization. Considering the cost of transportation and in order to encourage the use of residues and agro-industrial by-products, it is recommended that the site of utilization should be as close as possible to the site of production of these by-products or residues.

Handling and storage. It is recommended that each government study handling and storage organization for the most valuable crop residues and by-products. Molasses is easy to handle and store. Problems may arise for cakes and leguminous straw. It may be worthwhile to look at urea treatment (to generate ammonia) to prevent the development of aflatoxin. Quality control of such feeds should also be encouraged.

PROCESSING AND TREATMENT OF FEEDS FOR RUMINANTS

Processing and treatment of feeds for ruminants

a) Initially, no treatment is recommended, only supplementation.

   - The first step will be to use urea to supplement the by-product-based diet.

   - The second step is to use urea and good-quality forage (especially legumes).

   - The third step is to add oilseed cakes.

b) There may be a place for chemical treatment of crop residues to increase nutritive value. The only techniques which are likely to be economical are the use of urea (to generate ammonia), which is the most promising, and calcium hydroxide. Ammonia from urea also provides fermentable nitrogen and can help preserve wet straw.

GENERAL RECOMMENDATIONS

To help understand and establish desirable systems of livestock production that incorporate the use of crop residues and agro-industrial by-products, the workshop recommended that;

a) each African government encourage and support research in this field

which is of great importance to the development of the livestock sector in Africa;

b) continuous support be forthcoming from FAO, the EEC, ECA, ILCA and other organizations and donor countries to ongoing and future projects.

APPENDIX II

METHODOLOGY

Specific Objective a)

Scientists from six collaborating national institutions (one each from: Nigeria, Cameroon, Senegal, Sudan, Tanzania and Egypt), together with ILCA, will form a network that will be the nucleus for by-products research in Africa, and will be enlarged eventually. The scientists will meet annually to review progress, plan future activities and exchange services. Visits will be made by ILCA scientists to national institutions to provide technical assistance. On an annual basis, IDRC will select an experienced scientist from within or outside the collaborating institutions, to exchange ideas and provide expert opinions.

Specific Objective b)

ILCA will establish and maintain a data base (books, theses, microfiche and unpublished reports) on agricultural by-product utilization. A system of key words specific to by-products will be developed; collection will be catalogues and microfiched; and, bibliographic information will be transferred to the on-line computer system.

A bibliographic listing of the literature collection will be published for distribution to research workers. Hotocopies and/or microfiche of papers and literature will be sent to scientists on request. Emphasis will be placed on literature applicable to developing countries and Africa, in particular.

Scientists in collaborating institutions will identify and collect relevant information within their countries. Copies of documents will be sent to ILCA for documentation and dissemination.

Specific Objective c)

ILCA and National program scientists will prepare and distribute (through ARNAB) critical reviews of literature, with specific emphasis on applications in developing countries.

Specific Objective d)

A preliminary workshop will be attended by ILCA scientists, scientists from the six collaborating institutions and others, to standardize the terminology for feed descriptions (such as international feed descriptions, international feed names and country feed names) and analytical methods. (e.g.: Crude protein; neutral and acid detergent fibre; and, in vitro rumen fermentation-techniques and in vitro evaluation methods of feeds). Current methods of Weende Proximate, Van Soest, Tilley and Terry; and Cellulase Enzyme methods will be discussed. Bearing in mind the laboratory facilities in collaborating countries, standard methods of feed evaluation will be determined and published.

The workshop will also standardize methodologies for surveying the quantities and agricultural by-products produced and available for feeding in each country, as wll as methods for sampling by-products and sample preparation. Methods of estimation, based on grain, straw ration and physical verification of ratios will be discussed. On-farm research methods will also be reviewed.

Specific Objective e)

ILCA and national scientists will identify important by-products, using methdologies determined under Specific Objective d), by obtaining the following data:

- yield of crops produced in a country broken down by ecologicel zones;
- weight of field-crops residues and grain, to derive grain-straw rations;
- weight of by-product extracts from known original material; and,
- agricultural processing industries, marketing boards and statistical units on production of by-products.

Identified and sampled by-products will be described and evaluated, using the standardized methods.

Specific Objective f)

A workshop will be organized annually, to permit scientists from collaborating institutions and others to review the progress of various by-product programs, discuss developments in by-product utilization and plan future research activities. To facilitate the exchange of ideas and expertise, there will be inter-ARNAB visits for specific purposes (e.g.: fistulation of animals).

Specific Objectives g), h) and i)

While ILCA will concentrate on by-products found in the Ethiopian highlands, the six national institutions will focus on by-products which are characteristic of their target areas. Decisions on evaluation methodology and processing techniques will be based on discussions held during the various workshops.

Basic Studies

a) The effectiveness of urea treatment will be studied with variations in:

   i) urea levels
   ii) moisture levels
   iii) time of reaction
   iv) type of by-products
   v) types of equipment (e.g.: plastic sheets, earth pits & concrete pits);

b) similar studies, using anhydrous NH_3 and aqueous NH_3, will be made;

c) in vitro digestibility and chemical composition of various by-products will be determined, before and after processing, using standardized methods;

d) the effects of feeding leguminous haulm or forage, with cereal straws, will be investigated with regard to:

i) type of leguminous haulm or forage
ii) type of cereal straw
iii) ratio of straw to haulm or forage; and,

e) the effects of supplementation will be studied with locally available processing by-products (e.g.: brans and oil cakes), as influenced by:

i) type of supplement
ii) straw-supplement ratio

A wide variety of materials (e.g.: teff, wheat, barley, oat, maize, sorghum, millet, rice, beans, groundnuts, cocoa and cotton by-products will be sampled and subjected to studies.

In studies d) and e), in vivo digestibility, voluntary feeds intake and nitrogen utilization efficiency will serve as indicators.

Results will indicate the most favourable conditions for future in vivo experiments to be carried out on by-products with high potential identified in the network. These tests will place emphasis on digestibility, ad libitum intake and efficiency of nitrogen utilization. Mineral supplements will be provided, when appropriate, to avoid nutrient imbalance, and appropriate technologies will be considered at this stage.

Applied Studies

a) Diagnostic surveys will be made in the target areas, using standardized methods. An understanding of existing livestock systems will be acquired and constraints to increased production identified; livestock classes of high potential; for home use, consumption or sale will be identified and used for on-station and on-farm studies. The livestock

systems research protocol, as summarized by ILCA, will be followed. A consultant in livestock systems research will assist the national scientists.

b) Potentially useful by-products and technologies from the in vivo studies will be tested with the identified livestock classes. Animals will be fed under conditions simulating production situations. Emphasis will be placed on the measurement of growth rate, milk production, feed-conversion efficiency and fitness for draft power.

c) On-farm experiments will also supply feedback information to applied studies a) and b).

Multi-disciplinary Analysis of Effects of By-product Feeding on Small-scale Livestock Production Systems (Evaluation)

Technical results from the on-farm experiments will be analysed, in conjunction with detailed information on economics, and environmental and sociological aspects of selected livestock production systems. The overall impact of agricultural by-products technology; particularly, its economic feasibility, will be determined. This evaluatio, to be conducted at ILCA, may require short-term consultants (economist, and rural sociologist), well-versed in African practices, if such expertise is not available from the ILCA core staff. A consultant will also assist the national institution scientists.

Specific Objectives j) and k)

Short courses will be conducted at ILCA for selected laboratory supervisory personnel from ARNABA institutions, and for larger groups at laboratory technician levels. These courses (from two to eight weeks), will emphasize standard methods for laboratory and animal feeding trials.

As they are able to obtain their own funding, ARNAB-affiliated institutions will nominate candidates to be registered for M.Sc. degrees at an appropriate university, in a developing country or in Canada. Their theses will be on a by-product utilization study, conducted in their own institution or at ILCA headquarters. The training of African scientists

will strengthen the research capabilities of national institutions.

Specific Objective 1)

The standardized methodologies, from the preliminary workshop, will be published as a manual for free distribution. Four newsletters (8-10 pages/issue) will be published yearly, with contributions from ILCA and African scientists.

BENEFICIARIES

The participating research institutions will increase their research capabilities through the training of technicians and scientists. Also, the workshops will offer a forum to exchange ideas, and thereby improve the quality of research.

Farmers participating in the on-farm testing studies will be immediate beneficiaries. On a long-term basis, the proven technological packages will be adapted by farmers to provide increased animal protein supplies and incomes.