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**FEASIBILITY OF ESTABLISHING AN
INTERNATIONAL CENTER FOR
QUINUA AND ANDEAN CROPS**

(Report Prepared for IICA/Bolivia)

1990

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La Paz, Bolivia



Centro Interamericano de
Documentación e
Información Agrícola

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Executive Summary

Over 50 species of Andean crops have played a significant role in the support of Andean cultures for more than 3000 years. Through natural selection and dispersal, aided by intuitive human selection and dissemination, unique varieties evolved that were suited to the different ecosystems of the Andes topography. Many of these landraces continue to play a significant role in the livelihood of the rural highland people of the Andean region. They are adapted to the high elevation climates and soils. Some, like quinoa, are especially important because they can yield well under the low temperatures, low rainfalls and poor soils conditions in the Andes.

Past Neglect

From a technical perspective, these species have been neglected until relatively recent times when their exceptional agricultural and nutritional qualities were recognized (something which the early cultures had done centuries before.) Although these species have been of low political and economic priority, the subsistence farmers have carefully maintained them in their present day, complex production systems. Beginning in the 1970s, scientists began to systematically collect and assemble the wild and landrace materials and have established germplasm collections. Other researches began investigating different aspects of these Andean crops so that today, a good body of

literature exists relating to the botanical, agronomic, and genetic characteristics of these plants and also to their social, economic, and nutritional aspects.

Present Decline - Future Potential

A number of factors have led to the steady decline in yields and production of these crops, including pricing policies, climate, inadequate market incentives, deteriorating social conditions, absence of technical support structures, etc. These have been important factors in the migration of people from the sierra and rural areas to urban centers. Nevertheless, the potential is very high for increasing yields and area cultivated to these crops. Today, practically no fertilizer is applied to those crops even though it has been shown that there is a high yield response to nitrogen application. Additionally, there are large areas which could be sown to some of these crops (especially quinoa and amaranths). Some areas could even be mechanized and would be if there were a demand for these products. It is estimated that 100,000 hectares or more could be sown to quinoa alone in Bolivia.

Relative to other major food crop species, when measured by area sown, total production or value, the Andean crop species altogether represent a relatively small fraction of the regions agricultural output. Their special importance lies in their values to high Andean communities and potentially to meet new



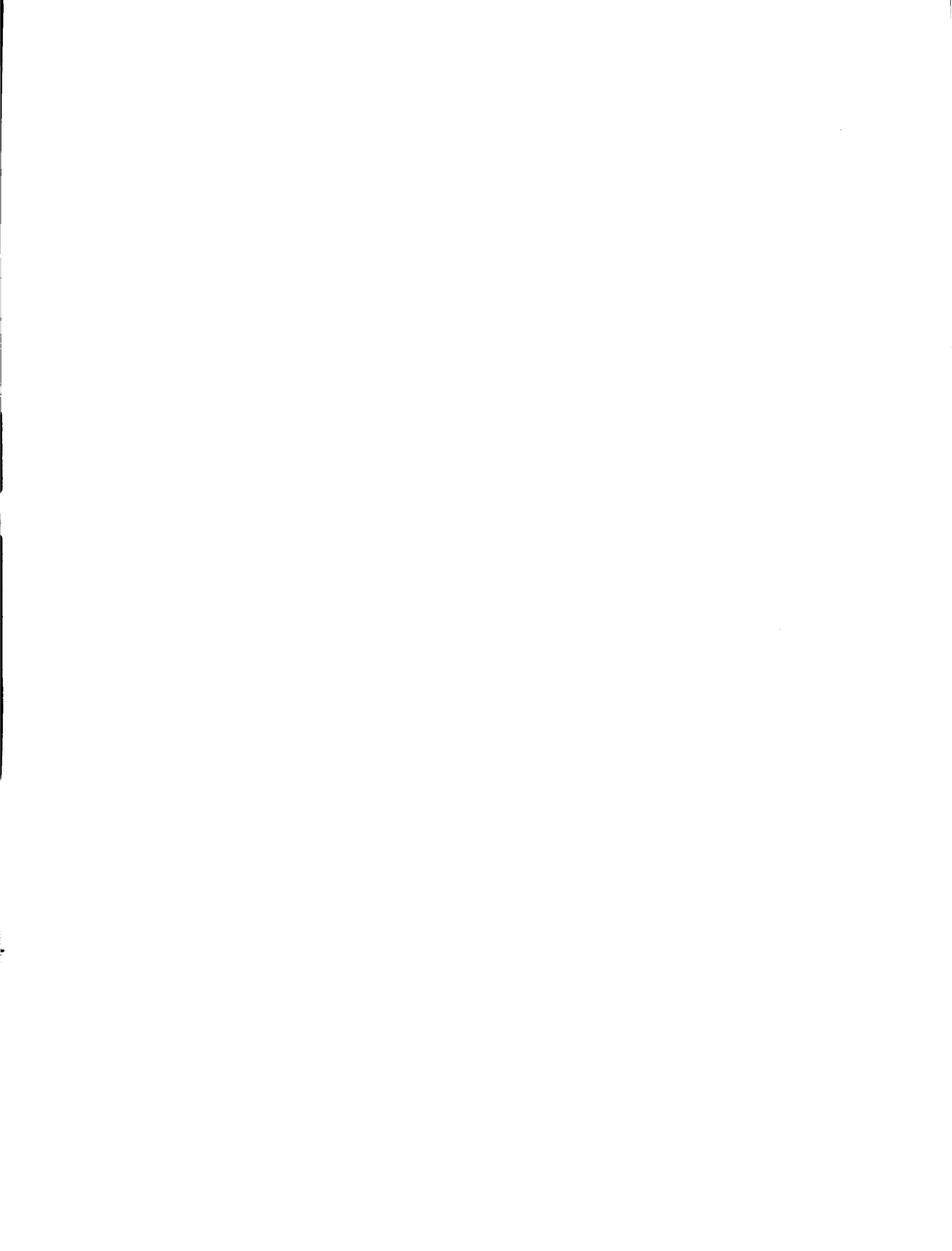
market growth. With the appropriate stimulus and technical support, it is possible that Andean species could have greater economic impact in the region than they do now.

Status of Research and Technology Transfer

Each of the Andean countries has some research capacity in Andean crops. Generally, research programs are not as strongly supported as they should be. Public research institutions are short of qualified people and funds to adequately carry out research. Private institutions, such as Universities, have contributed substantially to research efforts but they too are very limited in research support. Some technology transfer occurs, especially among the research scientists through informal networking. However, technology transfer from research institutions to farmers is inadequate. Some improved seed is available and sold to farmers but distribution systems are limited.

Research Facilities

In general, laboratory and field facilities in the different countries are adequate. There are deficiencies however in laboratory equipment and supplies and in field machinery and vehicles. While this is a general situation relevant to all research programs, it is particularly apparent in the case of Andean crops which have a lower priority than other research programs. A number of projects that receive special support



from international agencies are the main ones that are currently the most active.

Throughout the region, the main research stations and substations are adequately situated to provide a variety of environments in which research on Andean crops may be conducted. Field trials on farmers fields is also practiced by researches so that research sites, as such, is not a constraint to research programs. Lack of field equipment and funds for supplies is a serious problem.

Collaboration and Networking

Interest among individual scientists and National Agricultural Research Institutes (NARIs) in strengthening Andean crop research programs is evident. They are fully supportive of the Center concept and are prepared to cooperate in any way that is possible. The mutual benefits that are perceived include: training, scientific exchange, germplasm exchange, and participation in conferences and meetings. There is a need, and it would be welcome by scientists, to better coordinate research efforts both within each country and among countries. Separate programs, separately funded (often by different donors) more often compete with each other rather than constructively communicate. Donor support should be more effectively orchestrated particularly in view of the interest of donors in the Andean crops.



Findings and Recommendations

Markets and marketing systems related to Andean crops are poor or non-existent.

Government and the private sector jointly should address the problems of product development, and marketing systems. Although the private sector will ultimately package and sell products derived from Andean crops, government support could be critical in the early stages to accelerate this process. In addition, the present marketing channels are not conducive to producers who should receive adequate prices and have convenient access to crop collection facilities.

A major constraint to expanded Andean crop production is uncertainty about the size and absorptive capacity of rural, urban and export markets.

It is recommended that a thorough market analysis as well as an economic analysis of production marketing costs be conducted as a basis for developing market/production strategies.

Andean crops are produced mainly to satisfy the food needs of the people living in rural areas. Although a potential urban market (and an export market) might be developed there is little



factual information about the size of those market to adequately answer that question and to justify major public and private investments in the development of those crops. Furthermore unless there are adequate market incentives, producers will not adopt technology for expanding output beyond their needs.

There is a need to strengthen the national institutional/ technological base for generating and delivering new technology.

Each of the Andean countries lacks the resources to develop separate comprehensive programs. Mechanisms must be developed to pool human, physical, and financial resources, and to strengthen national capability to undertake development programs with Andean crops. Four options are proposed to accomplish this.

Strengthen existing Andean crop research programs - This would be the least expensive of the approaches suggested and is necessary to do in any case. The main limitations are that separate programs could leave many of the same gaps in research needs as are found today.

Develop an informal Andean crops research network - This approach essentially leaves the responsibility to each country however it would facilitate cooperation among the scientists.



There would be no institutional obligation nor division of labor among them.

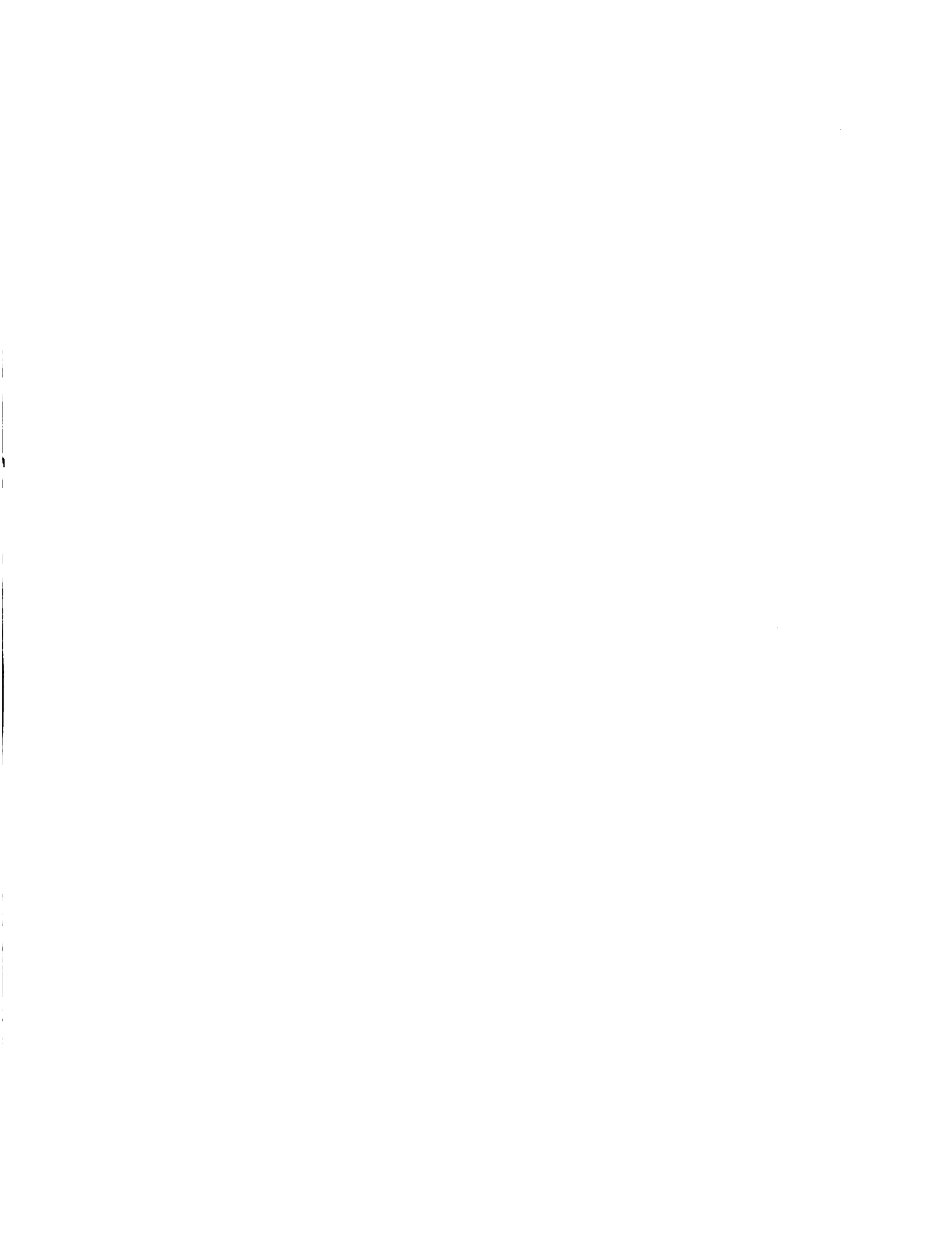
Formalize a regional network by adding Andean crops to the PROCANDINO program - This option has much to recommend it because a structure is in place and each of the NARIs assumes some responsibility in a coordinated program.

Establish an International Center for Quinoa and other Andean crops. An international center would provide a focal point for a major research effort and would assist national programs in their development efforts on Andean crops. A fully operational Center would require a substantial investment in capital expenditures. A less costly center or modified center could be established which could perform coordination and certain common functions but would have no research operation of its own.

The four options are feasible. The primary consideration is the availability of funding for their establishment and long term operation.

Further it is recommended that:

1. the governments and private sector jointly undertake to determine the current and potential dimensions of the different market outlets for Andean crops and following this develop a comprehensive production/market strategy.



2. the nuclei of national research programs of Andean crops be strengthened as a first priority.
3. the region develop a formalized structure for networking among the national research groups by incorporating Andean crops in the PROCIANDINO program.
4. consideration be given to establishing an Andean Crops Research Center to function primarily as coordination center and to perform certain common functions for the region such as documentation, training and germplasm conservation.
5. the technology transfer systems of the several countries be strengthened especially to assist the rural communities to improve productivity of Andean crops.
6. support and encouragement be provided to regional and international conferences to encourage participation of the international scientific community in the study and development of Andean crops species.
7. the work of donors and private voluntary agencies relating to Andean crops be better coordinated in each Andean country and regionally.

PART ONE

I. Introduction

Of the estimated 20,000 edible plant species, fewer than 150 have been "domesticated" and widely cultivated. Of these, only 22 provide the bulk of the nutrition of much of the world's population (NAS/NRC 1989). Most of the "major" species have benefitted from substantial investment in research and development, while most of the "minor" species have, until recently, received only casual scientific and commercial attention. Research on the Andean crops is not included in the programs of the International Agricultural Research Institutes (IARIs) of the Consultative Group on International Agricultural Research (CGIAR), nor in the research institutions of most of the industrialized and developing countries. It is well recognized, however, that some of the Andean plant species are very important in Andean cultures. Yet few mechanisms are in place to bring to bear on those species the scientific and commercial effort needed for their development. Nevertheless, there is a substantial literature available related to these species, on which a soundly based research and development program can be organized.

Although these species have been largely ignored by the modern day scientific community, they have been grown for more than 3,000 years by the people of the high (2,500 - 4,000 m)

mountain regions of the Andes (Gandarillas , 1982 and Tapia et.al. 1978.) Their unique qualities and variability provided the essential basis for the livelihood of those populations.

This document examines the rationale and justification for organizing a more comprehensive, coordinated research and development effort to realize the agricultural and economic potential of some of the most important species found in Andean subsistence farming and which may benefit other regions of the world as well. It will examine a research strategy and institutional framework in which a coherent cooperative multinational research effort can be organized and supported.

II. Antecedents

Various social, economic, political and technical factors have played an important role in the relatively recent concern regarding the development of plant species cultivated in the high altitude regions of the Andes. Demographic pressures, migration, unemployment, low incomes, few alternative crop species and limited markets have resulted in severe economic and social hardship among the people who inhabit the high Andes. Except for the potato, Solanum tuberosum only recently has scientific investigation begun to focus on some of the Andean plant species

primarily on quinoa (Chenopodium quinoa.)^{1/} In spite of the limited resources available, a few scientists from the Andean countries began in the 1970's to systematically study and evaluate these traditional species. Beginning in 1977, collections of germplasm materials began to be assembled (Holle 1986.) Agronomic and biological evaluation of several of the crops have begun and improved cultivars developed.

As early as 1968, workers concerned with Chenopodaceas began to meet regularly but informally. In 1976 a group of scientists decided to organize an International Congress on Andean crops to bring together research workers interested in various aspects of these crops. Six international Congresses have been held since that time. The Seventh Congress of this series is scheduled to be held in La Paz in February of 1991. It was at the Vith Congress held in Quito in 1988, that the participants expressed

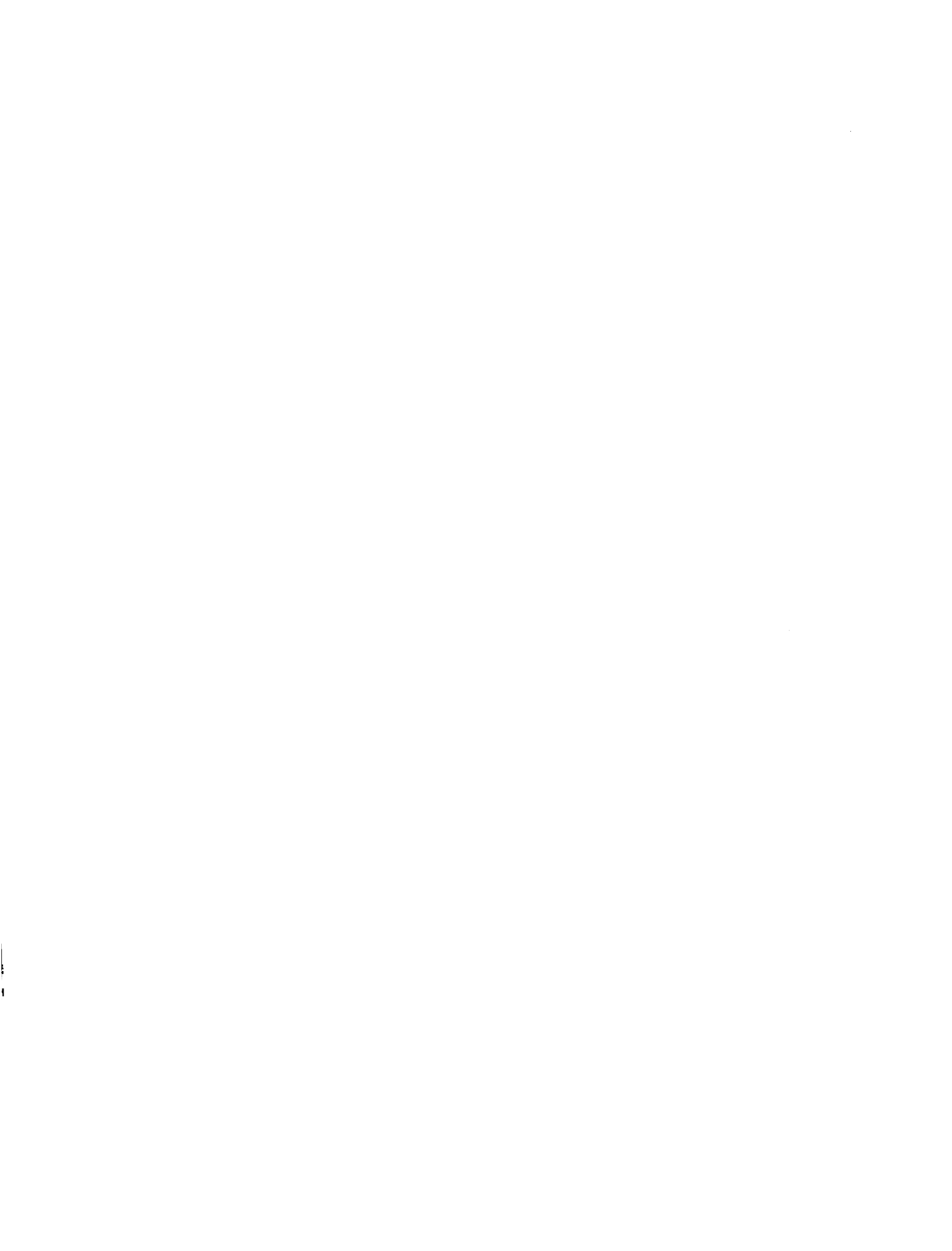
^{1/} Among more than 50 recognized species including 8 tubers, 6 root, 4 grain, 3 legume, 2 vegetable, 11 fruit and 2 nut species; the main focus of this report is on the grains Chenopodium quinoa (quinua); Chenopodium pallidicaule (kaniua); Amaranthus caudatus (kiuicha); the legume Lupinus mutabilis (tarui); and the tuberculus Oxalis tuberosa (oca); Ullucus tuberosus (Olluco); Tropaeolum tuberosum (mashua).

themselves on the desirability of creating a center for Andean crops and the necessity of seeking international and institutional support for its establishment. In the Conclusion and Recommendations of that Congress it was stated that "Dada la importancia que van adquiriendo los cultivos andinos a nivel mundial, se recomienda a los paises andinos y a otros paises interesados, incentivar la creacion de un Centro Internacional de Investigacion en Agricultura Andina que puede estar localizado en cualquier pais de la Region Andina."

In 1988 the Junta del Acuerdo de Cartagena organized a seminar on quinoa and Andean crops at which representatives of Venezuela, Colombia, Peru, Bolivia and Ecuador participated and at which the possible creation of an international center for Andean crops was discussed. The Minister of Bolivia proposed that Bolivia become the location for a Center.

At the Quincuagesimoquinto Periodo de Sesiones de la Comision del Acuerdo de Cartagena held in Lima on the 11-12 September 1989, the Ministers of Agriculture unanimously agreed to the suggestion of the Minister of Agriculture of Bolivia (Ministro de Asuntos Campesinos y Agropecuarios - MACA) for the elaboration of a study directed toward the creation of an International Center for Quinoa. The text of that proposal is as follows:

"Con relación al punto varios de la Agenda, el Ministro de Asuntos Campesinos y Agropecuarios de Bolivia planteó a la



Comisión la elaboración de un estudio dirigido a crear un Centro Internacional de la Quinua, fundamentando que el tema tendría un especial interés para la reactivación agropecuaria del altiplano andino y para reforzar esfuerzos nacionales sobre el particular. Indicó que, al respecto, presentará una propuesta formal que contenga los aspectos de infraestructura y financiamiento para la operación del Centro, proponiendo que en la elección de la sede pudiera ser considerada favorablemente su localización en Bolivia. Fundamentó la localización en el altiplano boliviano por el banco de germoplasma recolectado en su país y porque en este ya se han iniciado acciones vinculadas con la exportación a los mercados de países desarrollados.

El Señor Ministro de Agricultura y Ganadería del Ecuador haciendo suya la propuesta del Ministro de Bolivia sugirió que el ámbito de gestión de dicho Instituto se ampliará a tubérculos y raíces andinas.

La propuesta de creación del Centro Internacional de la Quinua, Tubérculos y Raíces Andinas, con sede en Bolivia, recibió el respaldo pleno de los Señores Ministros".

The Ministerio de Asuntos Agrarios y Agropecuarios (MACA) of Bolivia, with the technical cooperation of the Instituto Interamericano de Cooperación para la Agricultura (IICA) agreed to undertake a feasibility study for the creation of an International Center for Quinua and Andean Crops whose purpose

would be to conduct research and develop new varieties and practices suitable to actual and potential production areas. Although studies conducted by Bolivia specifically, Peru and Ecuador, and to a lesser extent in Colombia, Venezuela and other countries outside of the JUNAC region have contributed substantially to the information base about these crops, the results thus far are inadequate to generate the desired impact with those crops. Thus, it was felt that a cooperative effort by the several nations of the region, with the help of other international agencies, could overcome the constraints currently limiting the development programs for the vitalization of these agricultural species.

On February 23, 1990, the MACA and IICA signed an agreement under which a study would be undertaken to determine the feasibility of establishing an international center for Andean crops research in which IICA agreed to provide the technical cooperation for the execution of the study. (See Appendix I - Terms of Reference.)

III. Justification and Rationale for Intensifying Research on Andean Crops

Historically all successful civilizations have evolved on the basis of a dependable food supply. The hunter-gatherer civilizations gave way to more sedentary type of cultures based

on their ability to "domesticate" plant and animal species for food which provided greater security for their people. The dominant species that prevailed in different early human cultures varied with the natural systems prevalent in each region; i.e. wheat and barley in the Middle East and the Mediterranean, rice in Asia, sorghum and millets in Africa, corn in the Americas. In time as human populations grew and competed with each other, subsystems developed in which different groups of plant species became important, such as roots and tubers, leafy plants, fruits etc. The Andean cultures, built on plant species particularly adapted to high altitude climatic conditions developed into successful and powerful cultures (Tapia et al 1979).

Among the plant types which supported the highland populations were the following: potatoes, maize, quinoa, oca, ulloca, kaniwa and tarwi. All of these continue to be grown today, in much the same way as they were grown traditionally.

Social importance

It is estimated the total human population in the Andean region (including the populations of Bolivia, Peru, Ecuador, Colombia, Venezuela) is approximately 56 million persons of which 5-8,000,000 are rural highland populations living in areas between 2,400 - 4,500 m altitude above sea level. They are highly dependent on the few grains and tubers which are

indigenous to the region. Few alternative food crop species can survive and be productive at these altitudes and conditions.

The five countries of the Andean region vary considerably in population numbers (Colombia is the highest with 32 million, Bolivia least with 7.0 million), ethnic composition, demographic distribution between rural and urban, coastal highland and selva populations and in their economic base. All have important mineral industries. Agriculture employs a large segment of the population (Table 1) however the agriculture potential of the countries remains to be more fully developed.

Table 1. Significance of the Agricultural sector in Andean countries

Country	% of G.D.P.	Labor force % in Agriculture
Venezuela	7.4	15
Colombia	22.0	26
Peru	-.-	38
Ecuador	14.0	49
Bolivia	-.-	47

Source: Background notes U.S. Department of State.

Environmental factors

Agriculturally the critical environmental factors are soil quality, amount and distribution of rainfall (or water availability), and temperature. Much of the high mountains have poor soil, limited rainfall and less than half the year of frost

free days. Except for deep canyons, some hillsides and river flood plain regions, soils are shallow, rocky, low in organic matter and poor in nutrients. Rainfall in some regions amounts to 200-400 mm often poorly distributed over the months of November to March. At elevations above 3,500 m, frost damage is common in most cultivated species.

The rural populations follow complex farming systems (Valladolid and Nuñez 1986) incorporating rotation, mono and mixed plant cultivation, in which maize is the dominant species at the lower (3,000-3,400 m) elevations. Among the grains, only barley (cebada) fits into the systems. Quinoa is included as a security crop at higher elevations. In the potato "mono" culture, these authors report that as many as seven varieties may be found on a single parcel and over forty in a single community. Although production systems vary among farmers, communities, and countries in the Andean region, a basic tendency is noted, ie, where climate and condition permit, the preferred crop species include maize, potato, barley and haba. In the higher elevations, poorer soils and more limited rainfall regions, quinoa, oca and ulloca are the more common species. Agricultural systems in the high Andean region can be characterized as small size, unmechanized, low input subsistence farming. Farming systems are very complex and based on minimizing risk.

Agronomic studies are urgently needed to improve the management of soils and crops to conserve moisture, increase yields and increase labor output. The agronomic and economic impact of fertilizer application under different cropping systems must be examined. Improved varieties, adequately field tested, are needed for specific agroecosystems. Plant breeding efforts will need to be expanded in the future. The management of germplasm collections of the Andean species needs to be modernized even though some excellent work has been done (Holle 1986).

It is estimated that in the Altiplano norte of Bolivia there are approximately 100,000 hectares with conditions similar to those currently in quinoa production and which have few other cropping alternatives. Estimates for Bolivia show that there is ample opportunity for large scale production of quinoa (Gandarillas 1982). Theoretically, by increasing average yields to 1,000 Kg/h on both presently cultivated and potential area, total annual production of grain could exceed 150,000 tons in Bolivia alone. Undoubtedly there are similar areas in Peru and Ecuador. The comparative production levels of "Andean" crops with some other basic food crops is shown in Table 2.

Although a considerable and useful body of literature on Andean crops exists there have been no consistent, long term research and development efforts comparable to other important crop species. Many studies are conducted in isolation and contribute

Table 2. Production of some key food crops in Andean countries

Crop	Venezuela	Colombia	Peru	Ecuador	Bolivia
	<u>000 metric tons</u>				
Maize	1,400	908	880	387	416
Wheat	-	63	320	31	63
Rice	385	1,775	1,080	420	171
Beans	50	100	60	39	11
Potatoes	216	2,520	1,960	301	700
Cassaus	318	1,222	441	132	430
	<u>metric tons</u>				
Quinoa	-	-	24	555	22,000
Kiwicha	-	-	10,806	-	-
Oca	-	-	112,651	-	47,167
Olluco	-	-	76,088	2,255	17,640
Mashua	-	-	19,310	-	-
Tarwi	-	-	3,088	1,300	-

Source: FAO Production Yearbook 1988 and background countries papers.

little to the development of production technology. Even less has been achieved in technology transfer, in part through weakness in technology transfer systems and in part because the lack of market incentives leave little reason for producers to expand production beyond their immediate needs. The lack of market incentives is considered to be the major impediment to the adoption of improved technology. Furthermore, under today's social, economic and political conditions, it is safe to say that technology is ahead of the utilization of that technology. In spite of this however, given the right incentives, were farmers to accelerate production of quinoa, amaranths, oca and ulloca, present technology would rapidly become depleted.

Current production and market potential

The historic trends of production and yield (Tables 3, 4, 5, 6) give some cause for concern. There are those who suggest that the available statistics, which essentially show a decline in yield and considerable fluctuation in total production, are inaccurate and do not account for the amounts consumed by producer families. Also the data do not accurately estimate the amounts moved nationally and internationally outside of controlled trade channels. There is ample evidence to show that yield levels can be increased substantially. Gandarillas (1982) reported a high response to nitrogen application in quinoa increasing yields as much as four times above non-treated groups. Similar observations

Table 3. Cultivo de Quinoa en Bolivia

ANO	SUP. Ha.	Rend. Kg.	Prod. TM
1970	12.200	795	9 699
1971	15.000	700	10 500
1972	15.000	720	10 800
1973	16.000	750	12 000
1974	16.890	762	12 870
1975	19.240	790	15 200
1976	20.800	719	14 955
1977	22.400	403	9 027
1978	17.880	429	7 670
1979	10.455	574	6 001
1980	15.640	572	8 946
1981	23.040	566	13 040
1982	24.930	633	15 780
1983	43.086	272	11 719
1984	45.807	462	21 192
1985	47.939	441	21 141
1986	39.334	481	18 920
1987	41.268	505	20 840
1988	50.000	452	22 600
1989	32.113	395	12 684

Fuente: Departamento Estadísticas Agropecuarias MACA.

Table 4. Comportamiento de la producción del cultivo de Kiwicha en Peru

ANOS	Superficie Cosechada Ha.	Rendimiento Kg/Ha.	Produccion Tm.
1973	13.250	538	7 130
1974	12.980	503	6 532
1975	13.228	615	8 142
1976	15.065	576	8 676
1977	19.747	540	10 679
1978	19.439	526	10 231
1979	17.231	589	9 286
1980	18.634	750	13 993
1981	18.514	590	11 000
1982	21.769	680	14 867
1983	14.558	470	6 819
1984	18.370	660	12 153
1985	16.995	570	9 727
1986	20.358	520	10 538
1987	20.011	540	10 806

Fuente: OSE y estimacion PISA-Puno

Table 5. Comportamiento de la producción de Quinoa en Peru

ANOS	Superficie Cosechada Ha.	Rendimiento Kg/Ha.	Produccion Tm.
1977	15	466	7
1978	15	466	7
1979	15	466	7
1980	53	547	29
1981	48	583	28
1982	46	500	23
1983	42	476	20
1984	52	461	24

Fuente: OSE

Table 6. Trends in production, yield and harvested area for three Andean crops in Ecuador

	1984	1985	1986	1987	1988
QUINUA					
Sup. Cosechada (ha)	100.0	300.0	300.0	600.0	1230.0
Rendimiento (t/ha)	0.4	0.2	0.3	0.6	0.4
Produccion (t)	40.2	84.2	89.1	350.0	555.0
CHOCHO (Lupino) Tarwi					
Sup. Cosechada (ha)	785.0	834.0	2500.0	4100.0	3800.0
Rendimiento (t/ha)	0.3	0.5	0.4	0.2	0.3
Produccion (t)	467.5	479.0	1000.2	888.0	1300.0
MELLOCO (Ulloca)					
Sup. Cosechada (ha)	800.0	1400.0	2040.0	1700.0	950.0
Rendimiento (t/ha)	3.3	3.0	3.0	2.4	2.3
Produccion (t)	2627.0	4342.0	5625.0	4062.0	2255.0

Source: Ecuador background paper.

have been made in amaranths and in the tuber crops. Thus it would appear that there is ample potential for increasing yield and area sown to the Andean crops and in this way increasing total output.

Market considerations

Actual prices paid to producers on the one hand vary considerably depending on distance, time of harvest, and the particular situation of the producer. On the other hand, grain producers and intermediaries have not developed adequate marketing channels to facilitate collection, grading storage and movement of these products into consumer channels. Their response to this is that they cannot count on the volume or quality to justify the investment that an adequate market system would require.

It would appear then that the static production-market situation reflects a complex interacting system in which production expansion waits for market opportunity and market expansion development demands a larger, steady supply of quality product. The absence of a significant market demand and the lack of a market infrastructure is the major constraint to achieving significant production growth of quinoa and other Andean crops and the realization of potential economic benefits for rural populations. Although a number of "assessments" of market potential have been made, these have neither been comprehensive nor in some cases realistic.

There are basically three outlet channels for Andean grain crops:

1. home consumption by the producers
2. domestic market
3. export market

The on-farm use accounts for the bulk of the current consumption. The actual size of the latter two markets is comparatively small and inconsistent. The potential size is in fact, unknown, however some authorities estimate that if these markets were developed, they could absorb an amount of product equal to that currently being produced by Bolivia, Peru and Ecuador.

There is very little use made of Andean grain crops for animal feed purposes, at least on any commercial scale. Perhaps this also represents a potential market outlet for use of "surplus" grains which could increase their value through their conversion to and sale of animal products.

Another dimension of the export market potential is that of future competition for those markets by other country producers. Production and marketing costs will determine the competitiveness of these grains in export markets. There has been very little export promotion of these crops by Andean country organizations.

Market development will require the combined efforts of producers, government, and the commercial sector. If any progress

is to be made with Andean crops which will have a positive impact on the economies of the Andean highland populations, it is urgent that national marketing strategies be designed and implemented now.

Although some expanded market potential exists, the dimension of this is uncertain. However, unless a commercial market is developed, it is unlikely that producers can be encouraged to adopt new technology to increase production and production efficiency. The current production trends are indicative of this attitude.

Human nutrition and the nutritional value of Andean crops

A compelling argument can be made for wider use of the Andean grains to satisfy the nutritional requirements of the Andean rural populations. It is estimated for example, that 60% of the rural children in Bolivia suffer from level 1 malnutrition. the critical period is between weaning (destete) and age 5-6 years (Avila 1990). School feeding programs not only miss the critical age but later ages as well because of the disadvantages of rural children to attend school. Adequate nutrition in children (as well as adults) is determined by the quantity and quality of foods eaten. Recent studies in Peru, (Morales, 1990) and Bolivia, (Avila, 1990) have demonstrated the efficacy and economy of incorporating quinoa in food formula to restore the protein intake of malnourished children. Nutritionally, these formulas are as effective as powdered milk based formulas and cost is only a fraction as much.

These studies need to be expanded and linked to programs for facilitating the daily minimum consumption of easy to use food formulas by rural families. Such programs could also increase the market requirement for these locally produced grains.

The rationale for renewed attention to Andean crops may be summarized as follows:

1. a substantial number of people depend on these as subsistence crops.
2. under the environmental condition of the high Andes, few other crop alternatives exist.
3. expanded use of Andean grain crops could reduce malnutrition in rural children.
4. expanded commercial markets potentially could provide greater income and labor employment for Andean population.
5. there is considerable potential to increase production and production efficiency through increase in yields and area under cultivation in these crops.

IV. Current Status and Research and Technology Transfer

Significant research activity in Andean crops is carried out by different teams in the National Agricultural Research Institutes (NARIs) of Bolivia, Peru and Ecuador. Additionally, a number of Universities and private agencies have active programs dealing with



botanical, genetic, agronomic and other aspects of Andean crop species including nutritional evaluation studies. Although these research activities may seem modest by comparison with the research conducted on other agricultural crops, the quality and scope of the work is excellent, especially considering the limited resources available to the investigators.

A substantial volume of literature on Andean crops is available, however an exhaustive review of all the literature even that in the five Andean Pact countries, was not undertaken for this report. A centralized compilation with frequent updating is strongly recommended. An overall assessment of available professional staff, equipment facilities and funding in the five Andean countries would also be desirable. The following is a summary of information assembled for the study but should be expanded for future reference.

Technical Personnel

The professional staffs of the National Research Institute of Bolivia, Peru and Ecuador dedicating a part or all of their time to Andean crop species is summarized in table 7.

There is little information about the number, quality and level of dedication (time wise) of research personnel among the various programs of private institutions including Universities and research institutes. For example, the staff at La Molina includes at least one PhD and a Masters level investigator who conduct

Table 7. Current numbers of NARIs professional research staff on Andean Crops in Bolivia, Peru and Ecuador. (Data was an available for Venezuela and Colombia.)

Professional level*	Bolivia	Peru	Ecuador
PhD	-	1	-
MSc	-	4	1
Eng.Agr.	6	11	1
Agr.	2	1	1
Tec.	-	2	1

*does not include office and field support staff.

research and teaching. Much of the research at Universities is conducted as a part of student thesis accounting for some of the fragmentation in research programs.

Among all of the institutions, there is considerable variation to be found in the professional degree level of the researchers. Overall, it is apparent that the Andean crop research programs of most institutions need to be strengthened by additional numbers and training of professionals staffs.

Research facilities

Each of the countries visited, Bolivia, Ecuador and Peru appear generally to have adequate laboratory space and field research stations. The main limitations concern laboratory equipment and supplies, field machinery and vehicles. Additional

modern equipment is essential particularly for germplasm conservation, field plot trials and demonstration work. Because of the great variation in soil and climate types as well as variation within and among the Andean crop species, it is essential to have available suitable strategically placed sub-stations in which to test new varieties and cultivation practices. In this regard, Bolivia has more than 12 sites at which such work can be conducted while Peru has 15. Each of the Andean countries requires such facilities to conduct location specific research, however the availability of such sites is not perceived as a limitation at this time. Equipment and supplies for these sites are however, limiting.

Research programs

Research programs are focused primarily on six most important Andean species, Table 8. Limited research, mainly on varietal selection, is also conducted on some of the other species that are important in specific areas. Table 8 also suggests a relative order of priority of the six common species taking into consideration the distribution and area cultivated. Although somewhat arbitrary, it suggests the priorities likely to be agreed upon the relevant scientists for a major coordinated effort.

The major lines of research at the NARIs and Universities include:

1. varietal development

Table 8. The principal Andean crops of interests in the region

Scientific Name	Some Common Names	Use	Altitud m	Interest by Country					Overall Priority
				B	P	E	C	V	
<u>Chenopodium quinoa</u>	quinoa	grain	2,200-4,500	+	+	+	+	+	1
	quinua								
	kinoa								
<u>Chenopodium pallidicaule</u>	trigillo	grain							
	canihua								
	canigua								
	achitaa kaniwa								
<u>Lupinus mutabilis</u>	tarwi	grain	2,500-3,500	+	+	+	+	+	2
	chocho								
<u>Amaranthus caudatus</u>	amaranto	grain	1,500-2,800	+	+	+	+	+	3
	kiwicha								
	achis								
	chaquilla								
<u>Oxalis tuberosa</u>	oca	tuber		+	-	+	-	-	4
	quiba								
	papa roja								
<u>Ullucus tuberosus</u>	ulloco	tuber	2,800-3,800	-	+	+	-	-	5
	melloco								
	papa lisa								
<u>Tropaeolum tuberosum</u>	mashua	tuber	2,800-3,800	+	+	-	-	-	6
	isanu								

2. improved seed production
3. agronomic practices
 - a) plant density
 - b) fertilization practices
 - c) date of planting
 - d) weed control
4. germplasm conservation
5. disease resistance
6. plant protection

Some duplication and overlapping of research occurs among the countries. This is desirable and necessary on the one hand, on the other in the absence of closer coordination among research programs, opportunities are lost for maximizing the use of human and other resources and expanding the research programs into much needed areas. There is a considerable amount of socio-economic research conducted in the communities. At the V International Congress on Andean Agricultural Systems, there were 55 titles on agronomic aspects; 9 on post harvest; 8 on soils; 11 on food and nutrition; and 17 on economics and rural development. These are indicative of a broad based research interest on Andean crops.

In sum, while facilities and programs are generally good, improvements need to be made in program priorities, the number and quality of staff, and in the availability of equipment and machinery.

V. Objectives of a Program on Andean Crops

The objective of the Andean Crops Center is to improve the well being of Andean populations through expansion in yields and total production through the adoption of new crop varieties and improved agronomic practices.

To achieve the objective to accelerate change and improvements in Andean communities, the Center program must encompass the following activities:

1. develop the appropriate institutional framework to maximize the utilization of human, physical and financial resources in the region, and to facilitate cooperation, coordination, and exchange of information and materials internationally.
2. strengthen agricultural research related to varietal development, agronomic practices, seed production, plant protection germplasm conservation and use.
3. provide for linkage to, and support for relevant research in such areas as nutrition, marketing and socio-economics.
4. strengthen documentation and information capability including assembly of all specific reference materials related to Andean crop species and its dissemination.

5. provide for technician and field worker training to strengthen both the research and technology delivery systems.

A comprehensive effective program should incorporate all of these elements in a cohesive, interactive manner. The program should be charged with the delivery of materials (seed) and technology from its earliest establishment. It should develop "current state of the art" practices while additional technology is being generated and tested. Each member of the interdisciplinary team should have the responsibility of providing the most current knowledge in their respective area to the recommendations made by the program.

Specific objectives include:

1. the development of new varietal materials that are suitable in different ecosystems, are accepted by farmers and meet market requirements.
2. along with new varieties improved agronomic practices and use of inputs are needed to increase yield, productivity, and to conserve soil and water.
3. complimentary chemical and biological evaluation of Andean crop species should be made to expand their use in meeting nutrition goals.
4. product and market development should be emphasized early in the program to expand the demand for Andean crops.

5. assure the complete collection, characterization, documentation and conservation of germplasm materials of Andean crop species and their wild relatives.

The social and economic importance of Andean highland crops is now generally recognized by researchers and policy makers in the Andean countries. These crop species have received little attention relative to other agricultural species and as a result it is difficult to design suitable strategies for their development in the socio-agroeconomic systems of highland communities. The Andean country governments are anxious and committed to implement the programs necessary for the improvement of the social and economic conditions of the highland populations.

Considerable effort is needed to generate the relevant knowledge, assemble it in production packages (systems) and make it available to producers. The effective transfer of technology is vital in order to accelerate the rate of improvement in rural communities. Transfer of technology among cooperating scientists, between scientists and extension workers and from research/extensionists to farmers, needs to be carefully orchestrated and intensified.

VI. Program Strategy and Options

A suitable strategy for strengthening the research and development of Andean crop species should be commensurate with the social, economic and political importance of the crops.

The crop species that have been identified for priority attention are of primary concern regionally to the countries which have substantial rural populations living in the high altitude areas essentially on subsistence agriculture. The welfare of these people and their communities is an urgent social and political concern.

Economically, the Andean crop species represent only a small fraction of annual agricultural output in any of the five Andean countries. Although their potential importance in local and international markets could increase significantly, their value, relative to other crops, will probably continue to be marginal (see Table 2.)

Although from a global perspective no strong economic argument can be made for large research and development investment in Andean crops compared to that for traditional agricultural commodities, the technical, social and political factors in the Andean region provide the most compelling reasons for the support of a research and development strategy for these species.

The agricultural technology appropriate to the highland agriculture, particularly the low rainfall, frost susceptible, poor soil region is inadequate. That technology must be generated locally inasmuch as relevant technology is not available from other sources that can be introduced to the region as is the case with other major agricultural commodities. The key element of the

strategy followed in those commodities was and continues to be to bring to bear the efforts of a team of a highly competent interdisciplinary scientist on a clearly defined problem and to generate, assemble and disseminate the scientific information needed to have a measurable, substantial impact on yield and productivity. That strategy could be applied to the Andean crops.

Four options are considered, each of which has the potential to substantially contribute to the research and development of the priority Andean crop species. These are summarized in Table 9.

The feasibility of each is dependent upon:

1. commitment of individuals, institutions and governments to cooperation and collaborative efforts.
2. agreement on priorities.
3. availability of research infrastructure.
4. availability of financial resources.
5. nature of the organizational structure.

Funding requirements would be least with Option I and most under Option IV. These options are not mutually exclusive. On the contrary they can be mutually supportive. The advantages and limitations are shown in Table 9, while a rough estimate of financial requirements is shown in Table 10.

Option I. Strengthen existing Andean crop research programs

Each of the countries of the region now has an identifiable, modest research effort concerning Andean species. In spite of some weaknesses these programs could quickly be strengthened by providing additional funds, staff and equipment. Each nation would assume responsibility for their own program. A major limitation would continue to be the absence of access to any strong external source of research information and support.

Nevertheless, regardless of any other option that is adopted, it would remain essential to strengthen national capability needed to receive, adapt, test and deliver technology within each country context. An International Center is not a substitute for a national program. A commitment to strengthen national Andean crop research programs is essential in any case, and should be the top priority of any regional effort.

Option II. Develop an informal regional Andean crop research network (along the model of the Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimentarios (PCCMCA))

The highly successful and informal network, recognized as the PCCMCA, has been functioning for more than 30 years, long before there were international agricultural research centers. It has no formal organizational structure, is totally voluntary, and operates under the initiative and interest of the scientist

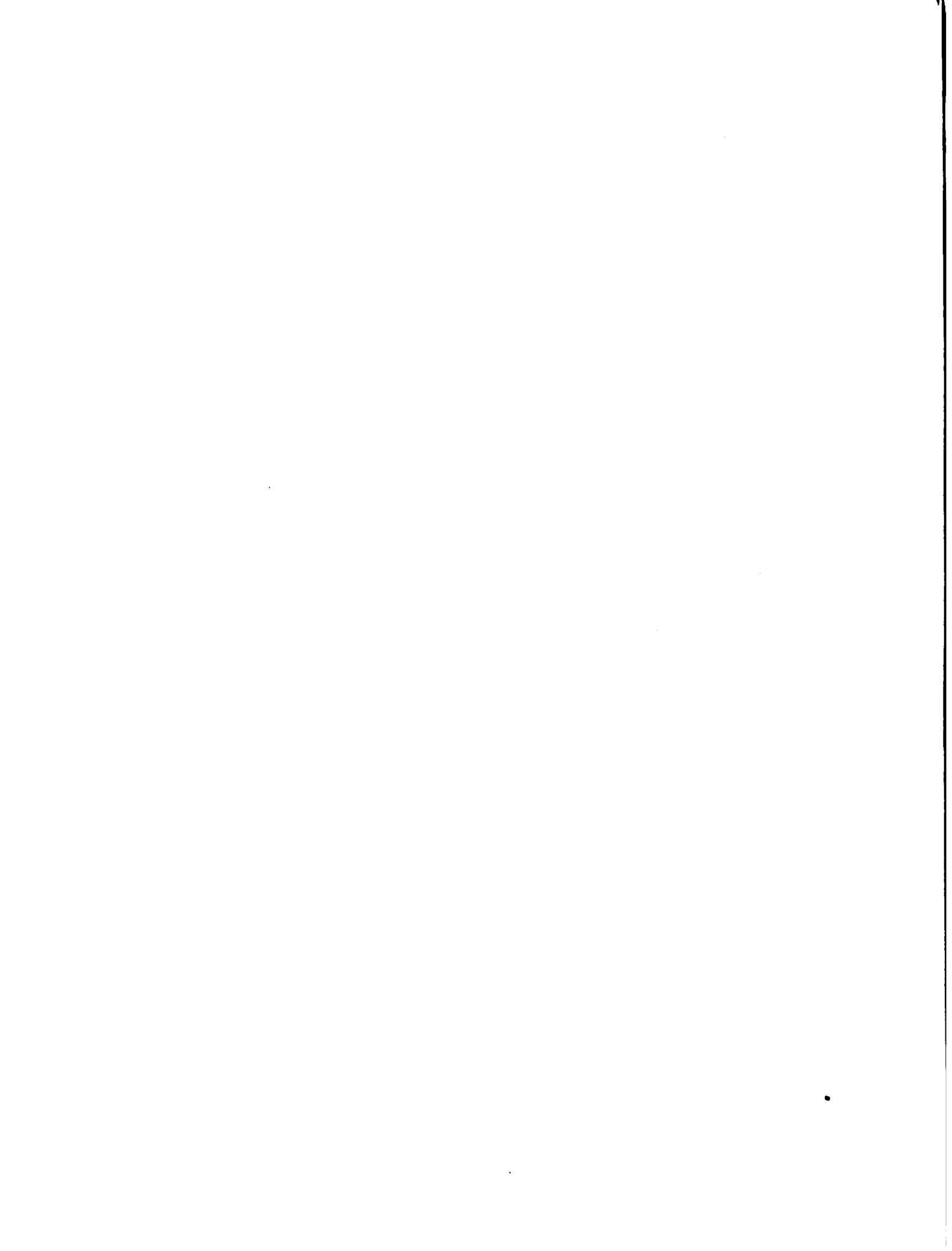
and institutions of the region. Periodic reunions offer the participants an opportunity to exchange information and materials and is a great stimulus to young researchers. Although originally focused on maize, potatoes and beans the interests of the PCCMCA go beyond those crops and beyond the Mexico/Central America region. Scientists from the Caribbean and South American countries also participate.

An informal network for Andean Crop would require little more than providing the opportunity (funds) for researchers to convene periodically in a host country.

While the activity requires no formal organization or structure and only modest funding, it would have little impact if national institutions remain weak. An informal network gives no assurance that research priorities will be met. Unlike the potato network in Central America (PRECODEPA), which is closely linked to the International Potato Center (CIP), an Andean crop network in the Andean region would have no linkage, at this time, to an international center. In the absence of any other regional initiative, an informal Andean crops network, built on existing meetings, conferences and cooperative efforts, should be vigorously supported.

Option III. Formalize a regional network by adding Andean crops to the PROCIANDINO program

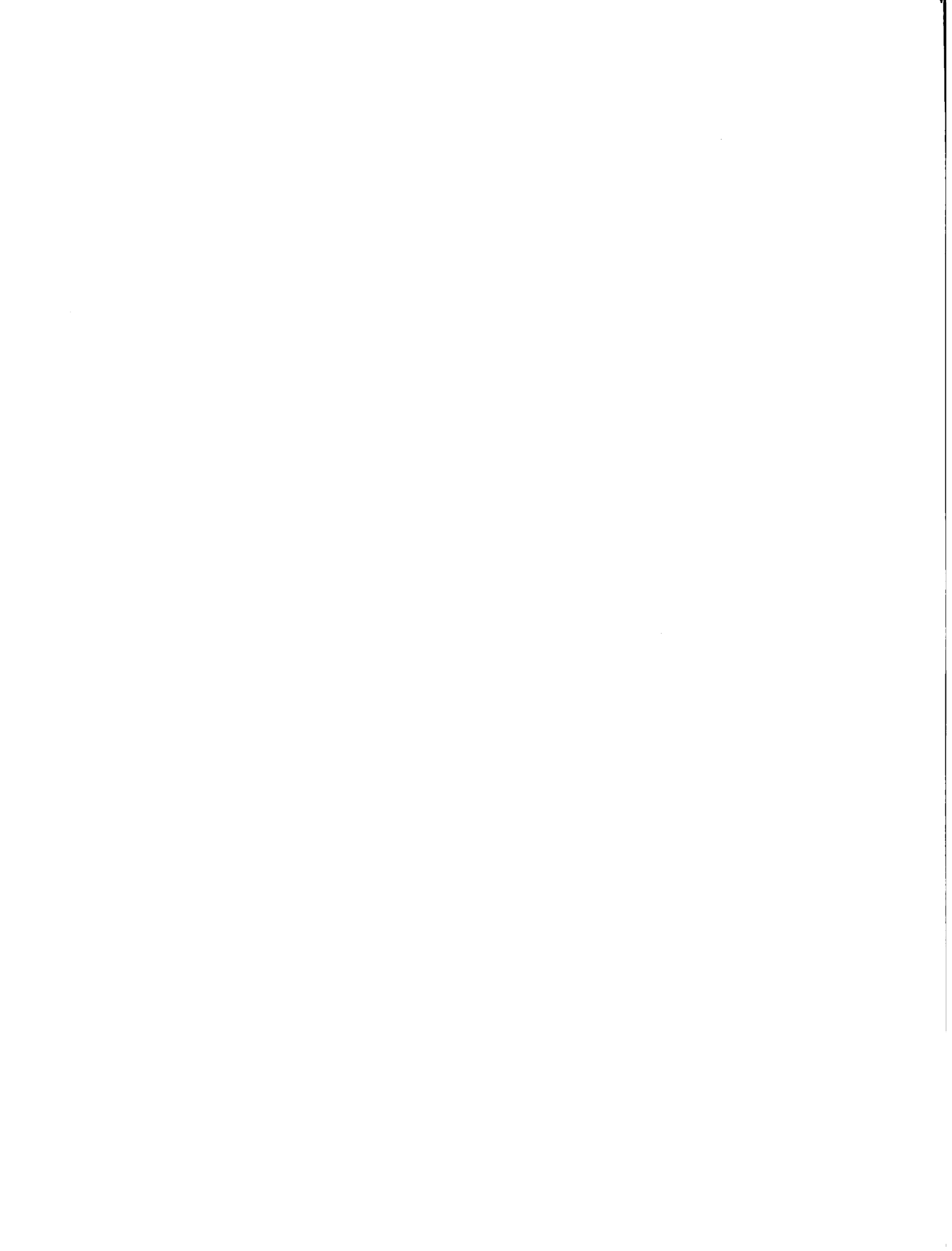
This option has much to recommend it. An organizational structure is in place and the system of collaboration/



cooperation is well established. It provides a means for strengthening national programs which is one of the main objectives of PROCIANDINO. The primary responsibility for program development rests with each country, however major gaps in those programs can be identified and jointly addressed. There is strong linkage to the international centers and strong logistical, administrative and technical support from IICA.

The regional programs such as PROCISUR and PROCIANDINO are an effective mechanism for vertical linkage of the IARC's to country programs and for horizontal linkage among national programs with similar interests.

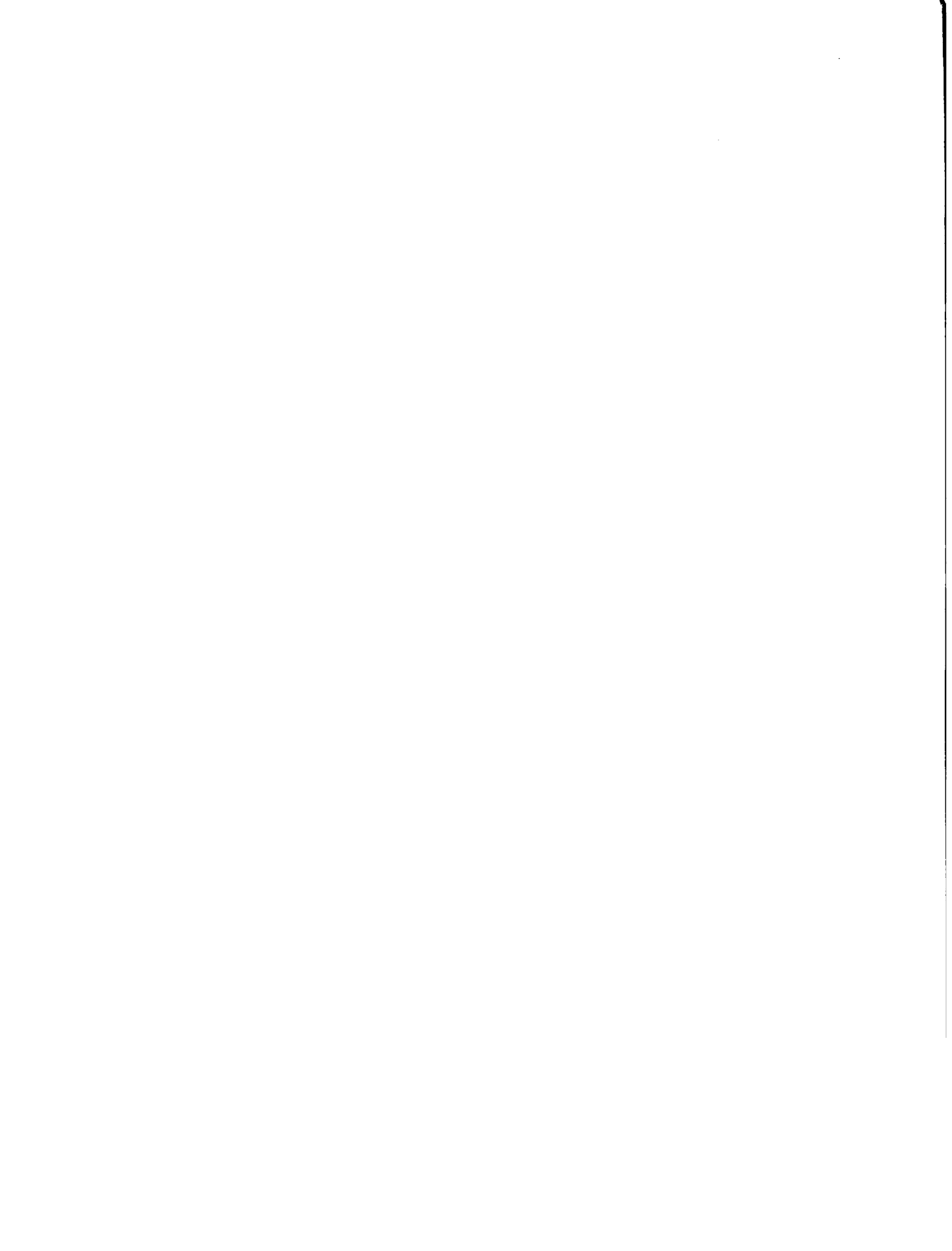
The inclusion of Andean crops is under consideration by the PROCIANDINO Consejo Directivo. If it is included, it should not be financially competitive with existing PROCIANDINO programs. Additional financial resources would be needed, however modest these may be. Nevertheless, the addition of an Andean crops program in PROCIANDINO may not satisfy all of the research and development requirements associated with the Andean crop species. No major international source of technology is available to support Andean crops programs in the region - as is the case with other major agricultural crops, including some for which no international center exists but in which considerable research is conducted in many other national institutions, providing a good body of reference knowledge.



With or without the creation of a Center for Andean crop research, it would appear desirable to support the incorporation of an Andean Crops program in PROCIANDINO. Possible mechanisms for linkage of a PROCIANDINO Andean crops program with a Center for Andean Crops Research and Development are discussed in a later Section.

Option IV. Establish an International Center for Quinoa and other Andean Crops

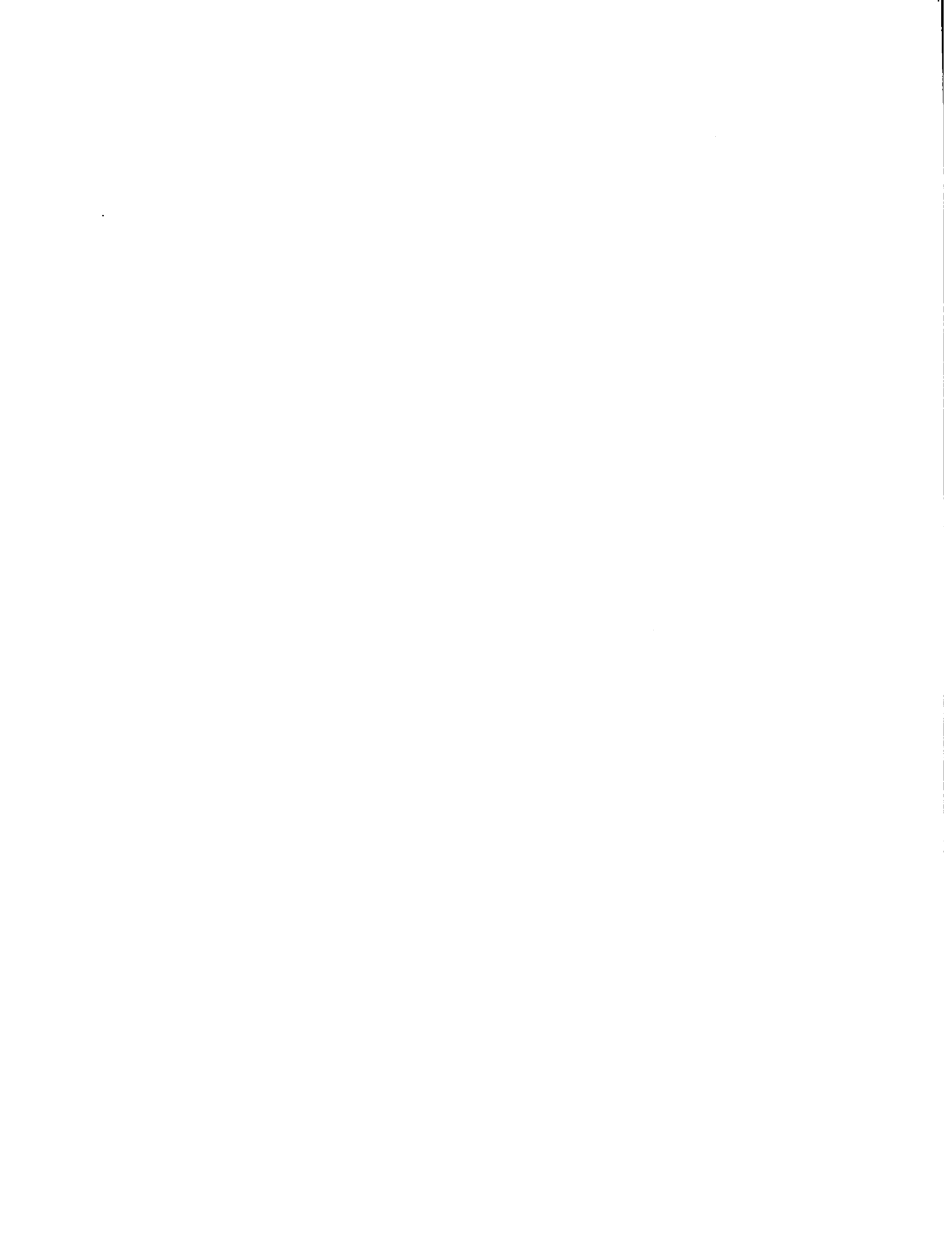
Establishing an International Center is a major undertaking. Although existing International Agricultural Research Centers, such as those sponsored by the Consultative Group on International Agricultural Research (CGIAR) and other international programs provide a useful model for structuring a multinational activity on Andean crops there are important differences which must be kept in mind. An important one is size and scope. The IARC's "international" character comes from the global importance of the crops they deal with. While one can argue that Andean crops are important regionally, they are relatively unimportant elsewhere. The "international" character of a center is determined in part by how it is structured administratively and organizationally, the nature of its programs and the sources of its support. The Andean crop center would need to be created with its own legal Charter and by-laws; its own multinational Board of Directors; a



multinational staff; a sharply defined program of broad interest; and multinational support.

The size of a center should be commensurate with the significance which the countries attached to the proposed program as well as the socio-economic importance of the crops. It is also important to bear in mind that the effectiveness of an operational Center depends upon the availability of a critical mass of well trained people, adequate facilities and funding. An Andean crop Center cannot be too large and cannot be too small.

In considering the possible creation of an international activity, it is important to bear in mind also (particularly if considerable dependence on external sources of funding is contemplated) that competition is very strong for research dollars in the international community especially among the CGIAR/IARC's and the dozen or so other independent international institutions, such as ,the Banana Center (INIBAP), the Irrigation Institute (IMMI), Tropical Soils Institute (IBSRAM), Asian Vegetable Institute (AVRDC), Winged Bean Institute (IBI) and others. Given the fact that globally, the Andean species are relatively low in economic importance, one cannot be overly optimistic about generating the level of financial contributions from international donors that would be required for capital and annual operating expenses. Although our preliminary



discussions indicate some potential interest among bilateral and multilateral donors, further exploration of this matter is necessary. At that point it will be necessary to have a well developed proposal to present to potential supporters of the Center.

"Modified" International Center Concept

An alternative to a fully operational Center is one which would have a small nucleus of staff at a designated location whose principal function would be to provide support for and assist in coordination of research programs in those institutions, both public and private, which have research programs in Andean crops. This arrangement could provide stronger cohesiveness and direction to multi-institutional approach that might be achieved even under Option III. It would have a full time professional leader and administrative operation. It would perform or facilitate certain common function on behalf of participant countries.

Several of the existing IARCS do not have operational (physical facilities) research programs of their own i.e. the International Board for Plant Genetic Resources (IBPGR); International Service for National Agricultural Research (ISNAR). Several of the non-CGIAR centers also operate in this way. Their modus operandi is to stimulate, support, and assist in coordinating the work of other institutions. Some have done

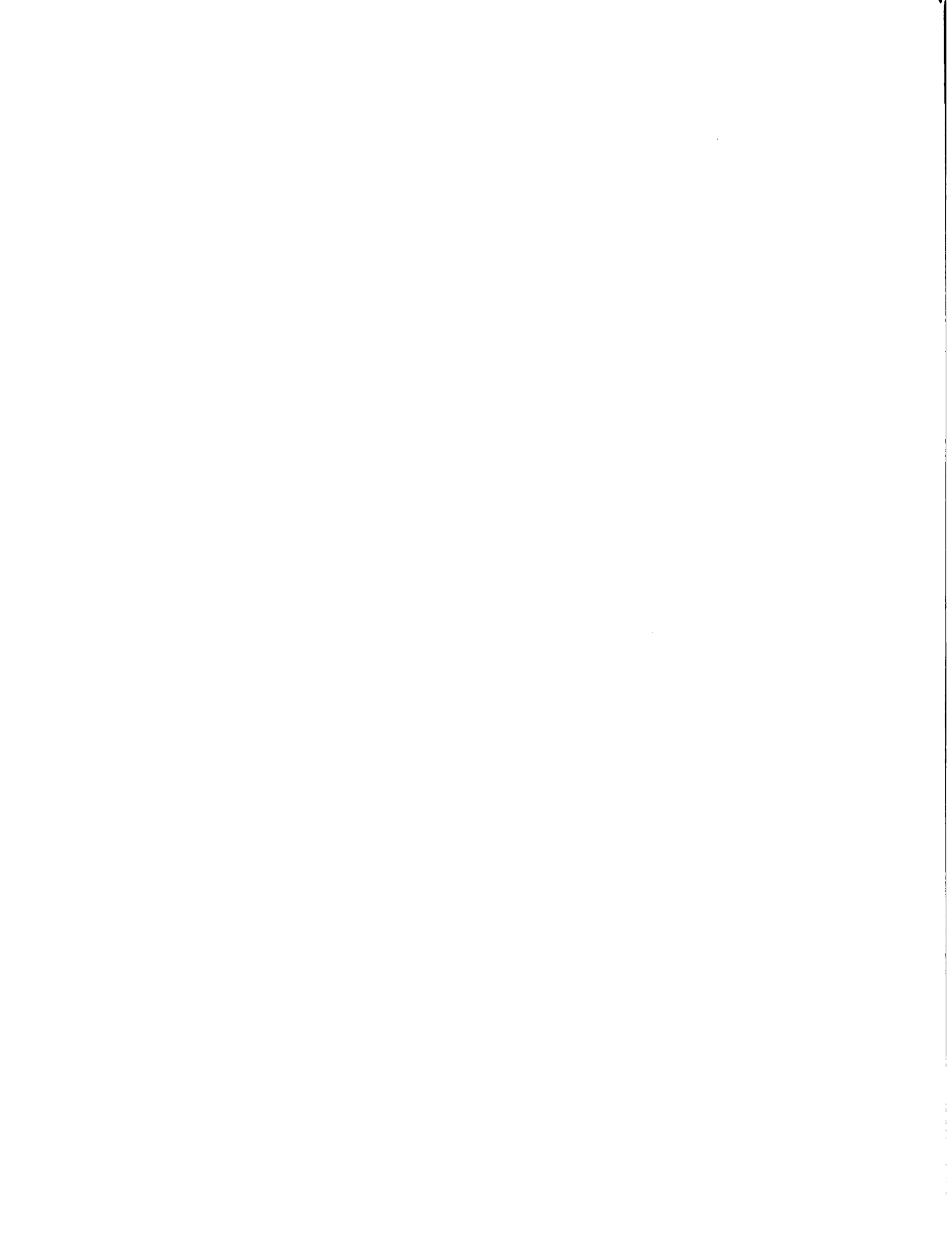


this quite successfully, such as the IBPGR. They are established as autonomous institutions, with a duly constituted Board, and a relatively small professional staff. These centers, or institutions, have a considerable influence in strengthening the research programs of cooperating institutions not only by providing funds but also functioning as a catalyst. They can assist in identifying and making available research specialists, in providing training opportunities, supporting documentation, dissemination and similar assistance.

The Center headquarters preferably is located close to a national research institute, a University or a convenient location from which it can perform its functions. The location should have good communication facilities and adequate accommodations for the staff.

Obviously the major advantages of this type of International Center operation are the modest need for infrastructure support and lower recurrent costs.

The impact which those Centers can have depends largely on their success in building national program capability, in networking those programs and strengthening technology transfer among scientists and from NARIs to farmers. The Center can have influence but no control over the research programs while an "operational" center with its own research program does have control.



The "modified" Center concept would fall between Options III and IV of those described previously. It would be an upscaled version of Option III, having an identifiable headquarters location and full time staff for the program. It could operate the base germplasm collection. Also it could manage the documentation and training operations in collaboration with the host institution. The recurrent cost for such a center might range from 1.0 million to 1.5 million dollars U.S. annually.

Assessment of interest and support for an Andean crops research center

There is a high level of interest on the part of the authorities in JUNAC in intensifying research and development related to Andean crops. In view of the unique importance of the Andean species in the region, it can be expected that JUNAC will play a key role in their future development. The high official level of interest already expressed by the ministers is vital to any future regional institutional development related to these and other crops (and livestock) species.

Officials in Peru and Ecuador, as well as scientists and educators, also expressed strong support for strengthening the research and development programs related to Andean crops. They are fully prepared to participate in a regional effort. At the same time, they are concerned about strengthening their national

Table 9. Institutional (Organizational) Options for Strengthening Research and Development for Quinoa and other Andean Crops

Option	Advantages	Disadvantages or Limitations
<p>I. Strengthen existing Andean crop research program in each country</p>	<p>systems already exist least costly no time lost in program development simplest management system direct linkage to national programs each country responsible for funding</p>	<p>level and scope of research limited limited access to external technology competition for funds within institution</p>
<p>II. Develop informal regional Andean crop research network (along the model of PCCMCA)</p>	<p>informal; no obligatory functions individuals and institutions seek own funding participation by individuals voluntary requires no major investment in capital costs.</p>	<p>lack of cohesive organizational program no definition of goals or assurances they will be met funding problematical; difficult for individuals programs focus on interests of individual, institution or country Absence of international research institute support</p>
<p>III. Formalize a regional network by adding Andean crops to the PROCIANDINO</p>	<p>administrative organization is in place coordination of research effort is assured division of labor can be better programmed results shared more quickly training opportunities are enhanced external support facilitated and coordinated.</p>	<p>additional financial resources needed more difficult to support related activities such as marketing and nutrition work more difficult to achieve single focus.</p>

Option	Advantage	Disadvantage or limitation
<p>IV. Establish an International* new Center for Quinoa and other Andean Crops</p>	<p>a new autonomous center, with new talent, new incentives and a clear mandate has greater opportunity to contribute effectively to development more efficient use of regional professional resources can focus on limited priorities easier coordination of cooperative research projects longer term planning possible multiple funding base centralized management structure.</p>	<p>new institutional structure required requires international legal support and agreements management structure while centralized is larger and more complex than a national program multinational funding required frequent monitoring and evaluation is needed</p>

* for purposes of this report, the term "International Center" is used to describe mainly the organizational characteristics of autonomy, an independent Board of Governors, privileges, immunities and multinational outreach. The term is not intended to imply size or dimension similar to CGIAR/IARC's.

**Table 10. Estimated Capital and Recurrent Costs (US\$)
for the Different Options for Strengthening
Andean crop Research in the Region**

Option	Capital <u>1/</u>	Recurrent <u>2/</u>
	Dollars (U.S.)	
I	2-300,000	500,000
II	3-500,000	500,000
III	2.5-500,000	5-700,000
IV	2.5-3,000,000	2-3,000,000

1/ capital costs include additional laboratory and field equipment, supplies and capital construction.

2/ including current expenditure plus additional funds for strengthening existing NARIs in options I, II, and III. costs.

efforts. They feel that a regional or international Center could be mutually helpful in the region.

While moral support for a Center concept is very positive, it is very difficult to ascertain the level of other tangible direct support. All individuals agreed with the ideas of sharing materials, conducting cooperative research, training seminars etc. Most national institutions themselves are in need of additional financial support. One of the greatest contributions a Center could make is to strengthen local research through financial support of collaborative research projects. In conclusion, the level of regional support is very high.



PART TWO

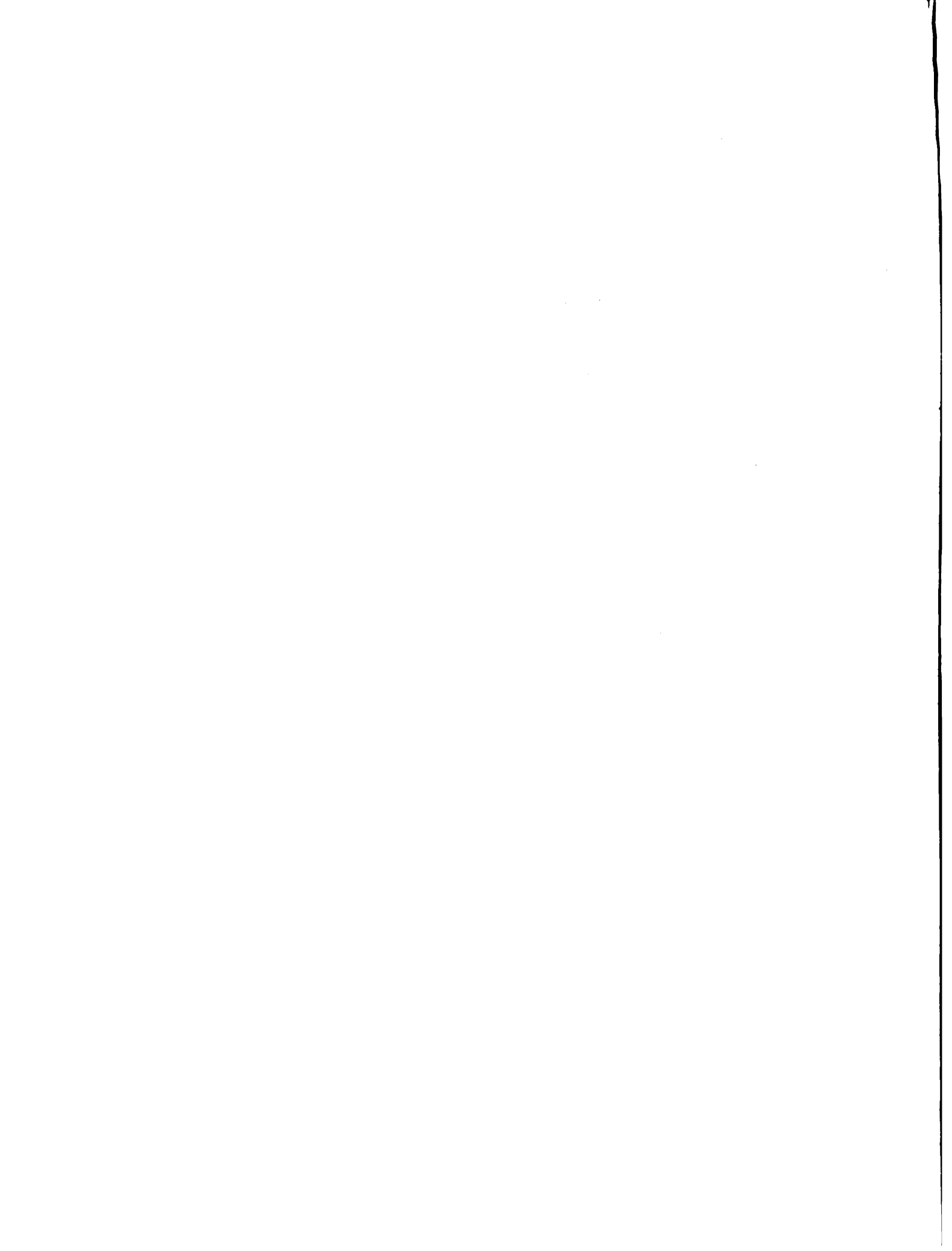
VII. Establishing an International Andean Crops Center

Depending upon the likely resources available, the Center could be structured either as an operational research entity with appropriate staff, facilities and budget or as a coordinating entity which would have a minimum administrative staff, little if any research activity of its own no physical installations and a modest budget.

Legal basis

In order to function as an international center, the institution must possess certain key characteristics which will first, allow it to be perceived as an international center and secondly, permit it to operate in an international environment.

It must have a legal basis established under either a recognized international organization (for example the U.N., the OAS, or the Andean JUNAC) or under the laws of the host country. Usually this latter option will require registry of articles of incorporation (depending upon the existing laws), a Charter and by-laws (reglamento). A sample document is shown in Appendix II. Specific documents applicable to the Center and to Bolivia would need to be drawn up. They will have to include special provisions for immigration and customs exemptions, personal tax exempt status and other immunities for international staff. The



institution should be considered autonomous and non-profit. It should be given the privilege to import supplies and equipment needed for its programs, duty free.

Organizational Structure

The institution will be structured in three hierarchal levels:

(1) Governance

The Board of Directors is the maximum authority of the institution. The Board should not be a large body. Its composition and functions will be clearly spelled out in the by-laws of the Charter. The members of the Board are required to participate personally in the meetings.

The following is a possible membership structure.

The Minister MCAC - ex officio.	1
Director of the Center.	1
Director NARIs of Andean Countries.	5
Executive Secretary JUNAC.	1
Internationally recognized scientists.	3
Commercial sector.	1
University Rector.	1
Farmer organization.	1

The Board will have a Secretary who has no voice, or vote. The secretary could be the Executive Secretary of the Center staff.

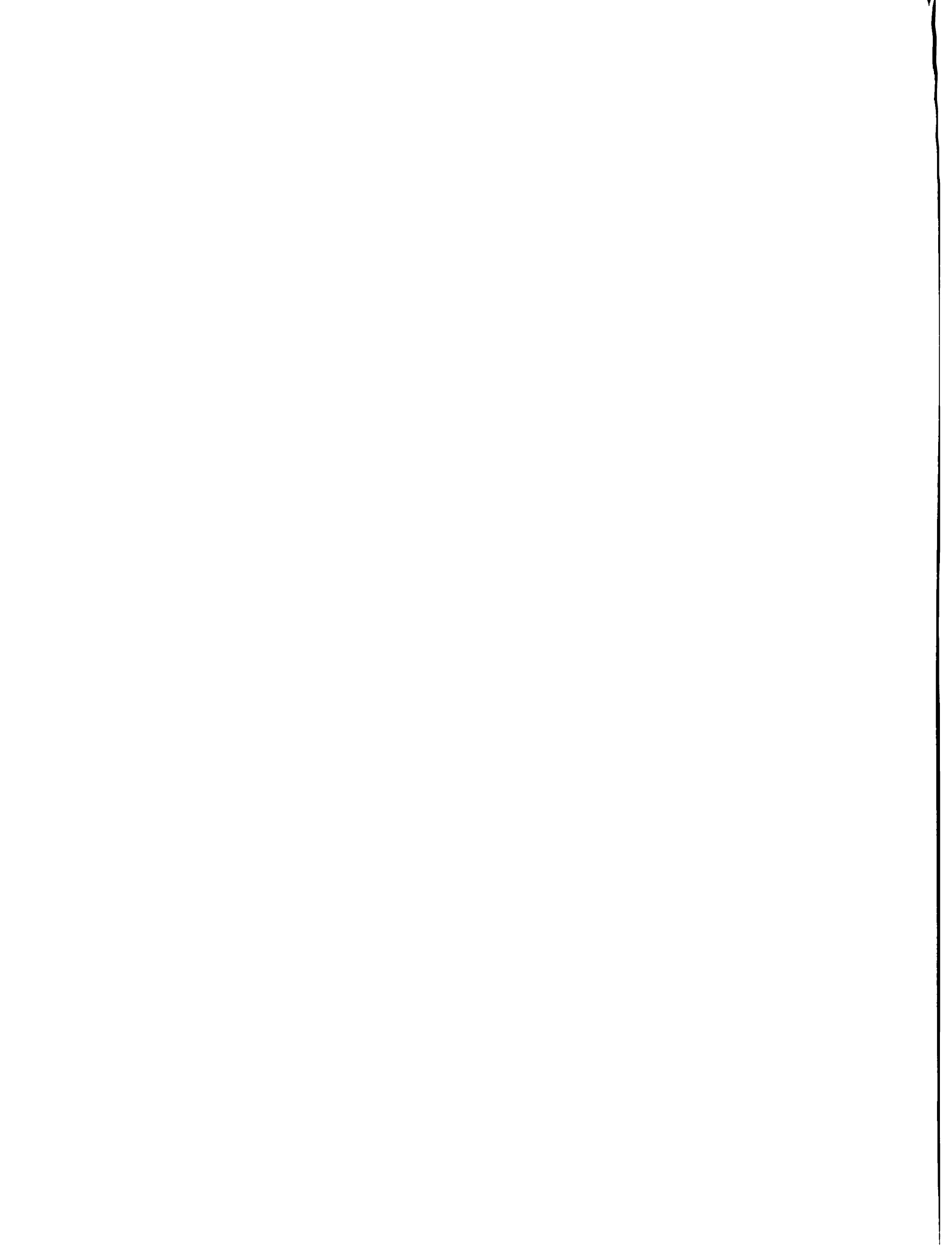
Actions of the Board at its first meeting will include:

1. election of the Chairman (Presidente.)
2. appointment of the Director.
3. approval of the program of work.
4. approval of the budget.
5. approval of the by-laws (reglamento.)
6. establish the system of rotation of Board membership.
7. set the date for the next meeting.

The sponsors of the Center may wish to seek the assistance of an independent agency to bring the Center into being. The appointment of an Executing Agency can be extremely helpful in the preparation of necessary documents, identifying candidates for the Center Director position and preparing for the first organizational meeting of the Board. IICA would be ideally suited for this purpose.

(2) The Administrative Group

The administrative group consists of the Director, the Executive Secretary, and their support staff. The program directors constitute the Advisory Group to the Director.



(3) The Operations Group

The operations group level consists of the Program leaders, technical and support staffs.

Program and program staff

It is envisioned that the Programs would include the following:

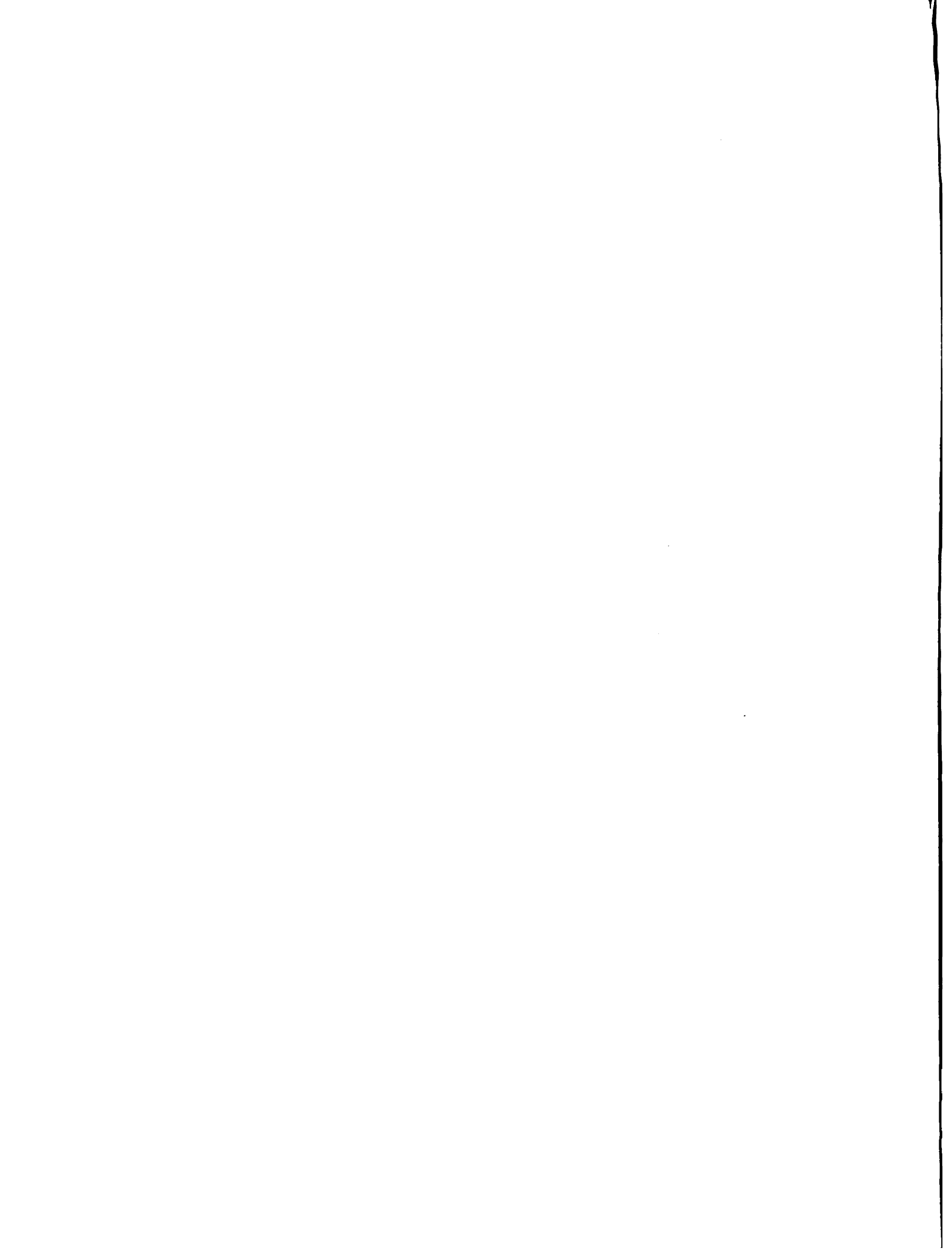
1. Research Program including cooperative research programs.
2. Training, Documentation and Technology Transfer.
3. Germplasm Conservation and Seed Production.
4. Administration.
5. - Field Operation Units.

The basic organic structure is illustrated in Fig. 1.

The Center would require a professional staff of approximately 18 persons (Table 11.) In addition to experience and personal qualities, all professional staff should have advanced professional degrees or their equivalent.

(1) The Research Program

The primary focus of the research program should be on quinoa. Major emphasis should be given to varietal development and agronomic practices particularly involving soil fertility and management. Research on other Andean crops should only be initiated



when the Quinoa program is well organized. Research priority of other crops was shown in Table 8.

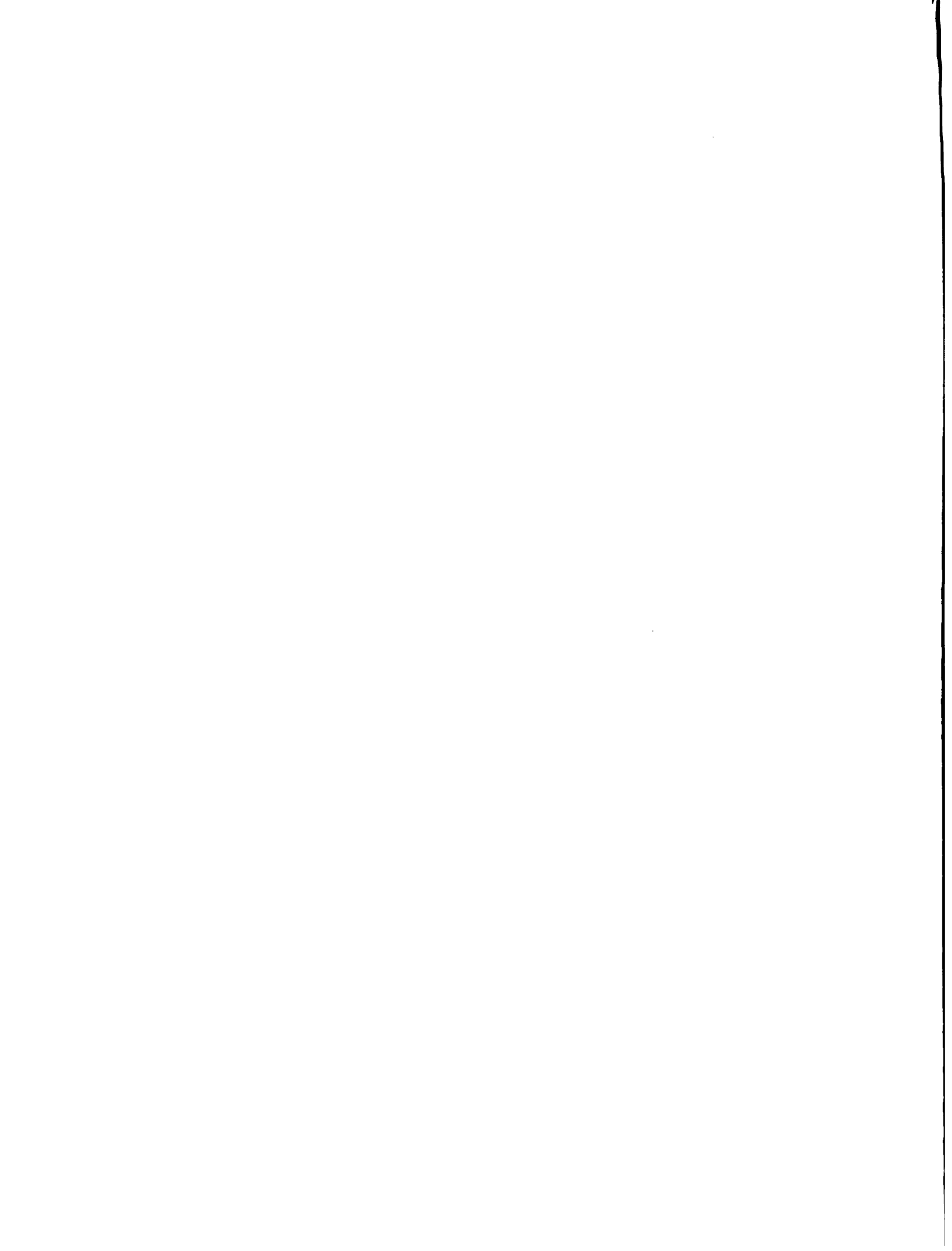
(2) Training, Documentation and Technology Transfer

This will be one of the most important programs of the Center. It has been shown that a major impediment to expansion in the production of quinoa and other Andean crops concerns market systems and market development. The Center should be an aggressive catalyst to stimulate product development, market handling and orientation of producers to market requirements.

Information systems and dissemination are important functions of this program. The IARC's have much useful experience in the areas of training, documentation and technology transfer. The leader of this program should be thoroughly familiar with these and similar programs.

(3) Germplasm Conservation and Seed Production

Although, these are essentially separate functions within the Center, they can be performed within the same program. The germplasm collections urgently need to be assembled, adequately documented, computerized, characterized, and conserved. A base collection (long term storage at 18 C and 5-7 percent seed moisture)



Should be established that is linked to the active collections held in various institutions in the region. The Center could be designated as the world base collection for Andean crop species by IBPGR if it meets the IBPGR standards.

The program should assume responsibility for distribution of materials from the base collection (when necessary) to breeders and for distribution of foundation seed from the Center breeding programs. It should not produce commercial seed.

(4) The Administrative Unit

The administrative unit is responsible for personnel, purchasing, inventory and financial management. The unit leader is responsible to the Director of the Center. It is essential that this unit function under the most rigorous standards.

(5) The Field Operation Unit

One of the most frequently neglected aspects of experiment station operations is that related to land management, field plot preparation, irrigation management and maintenance, machinery and equipment use and maintenance. Much valuable time and money is wasted when field research cannot be done because of broken down machinery. A good field operations unit manager is essential for the proper maintenance and running of the research facility.

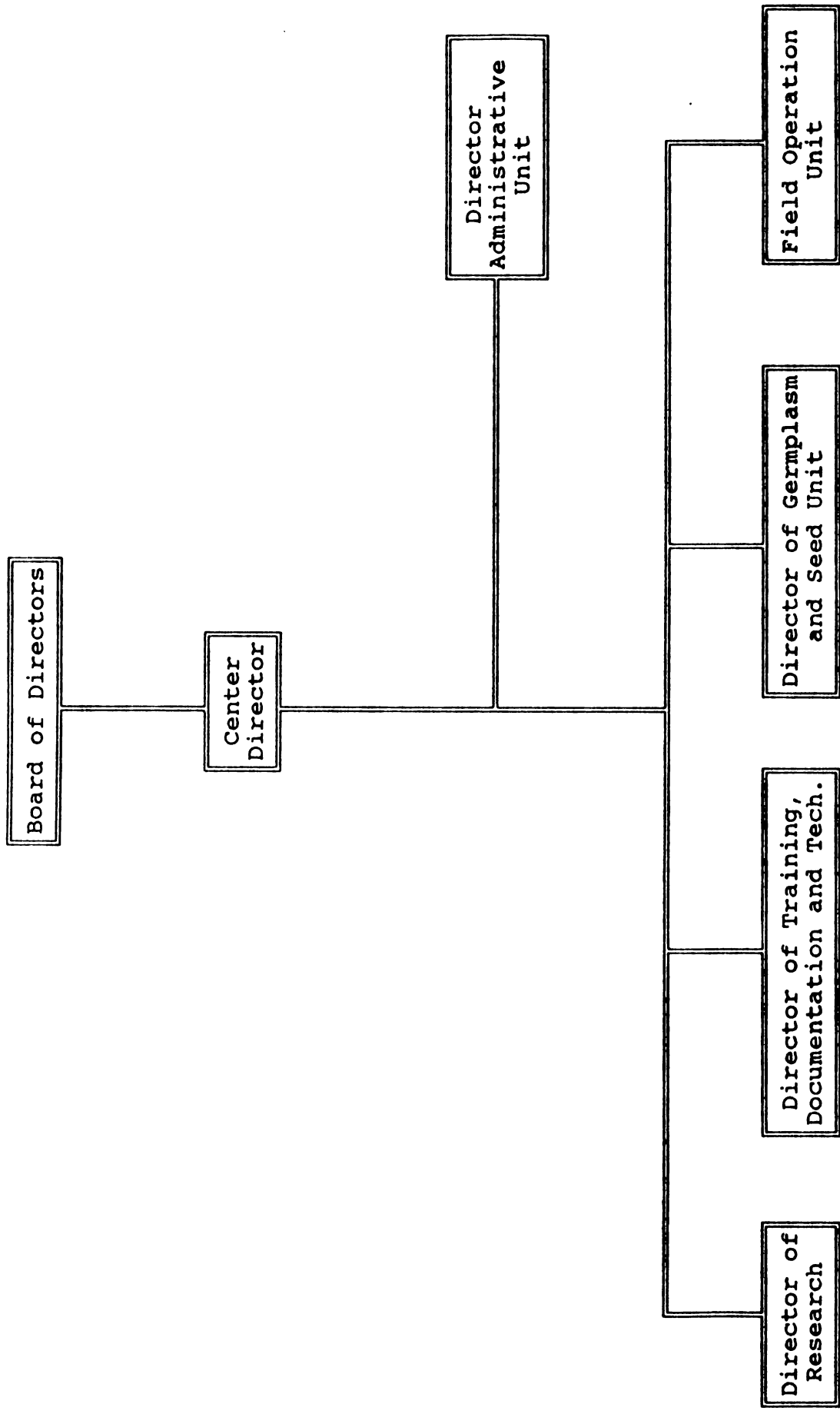


Fig. 1 Organizational Chart of the Basic Structure of the Andean Crop Center.

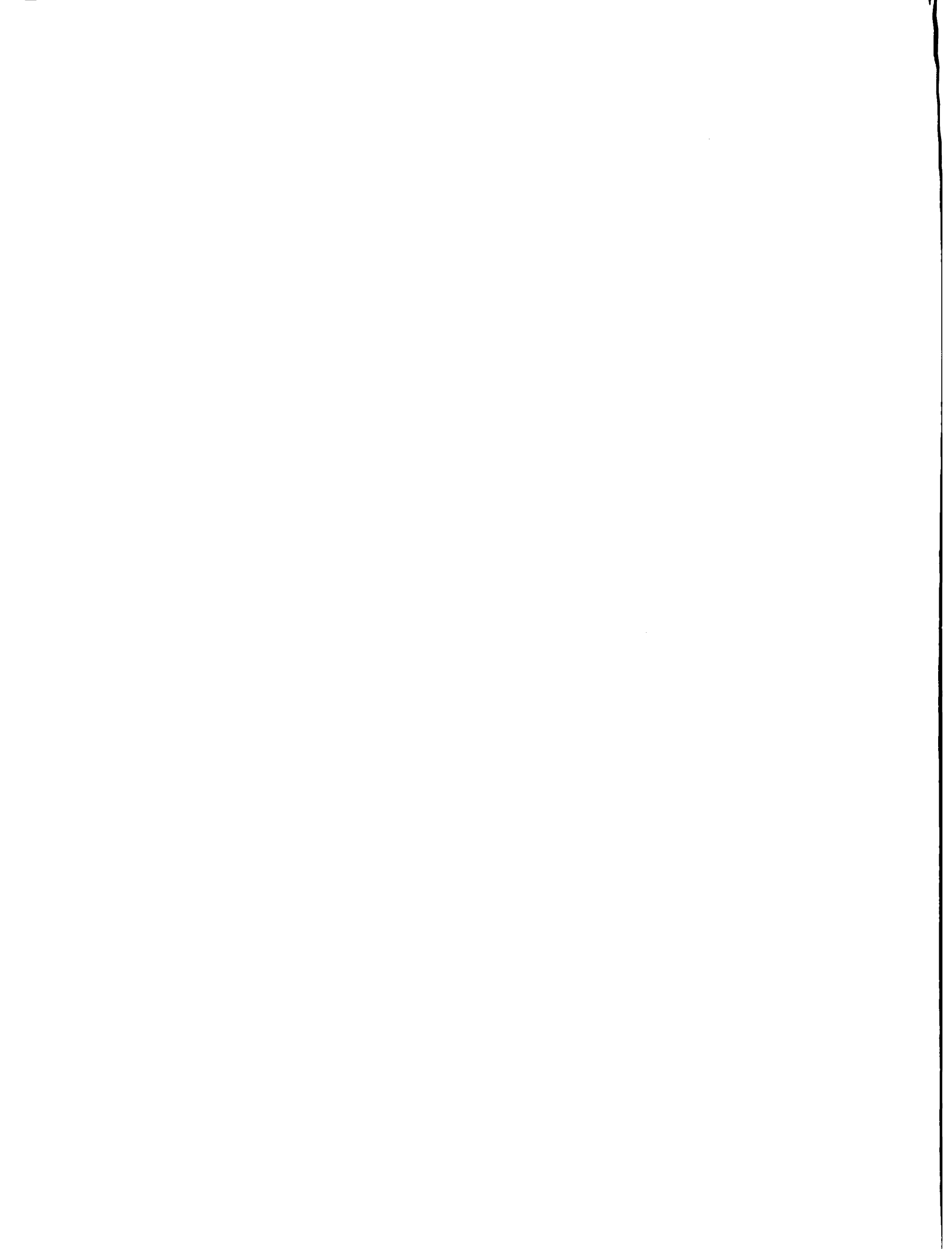


Table 11. Summary of Professional Staff Requirements

Staff Position	Number
Director	1
Executive Secretary	1
Research Director	1
Plant Breeders	2
Plant Pathologist	1
Entomologist	1
Soils	1
Agronomist	1
Economist	1
Documentation Specialist	1
Training Specialist	1
Rural Sociologist	1
Germplasm Specialist	1
Seed Specialist	1
Experiment Station Manager	1
Personnel	1
Finance	1
Total	18

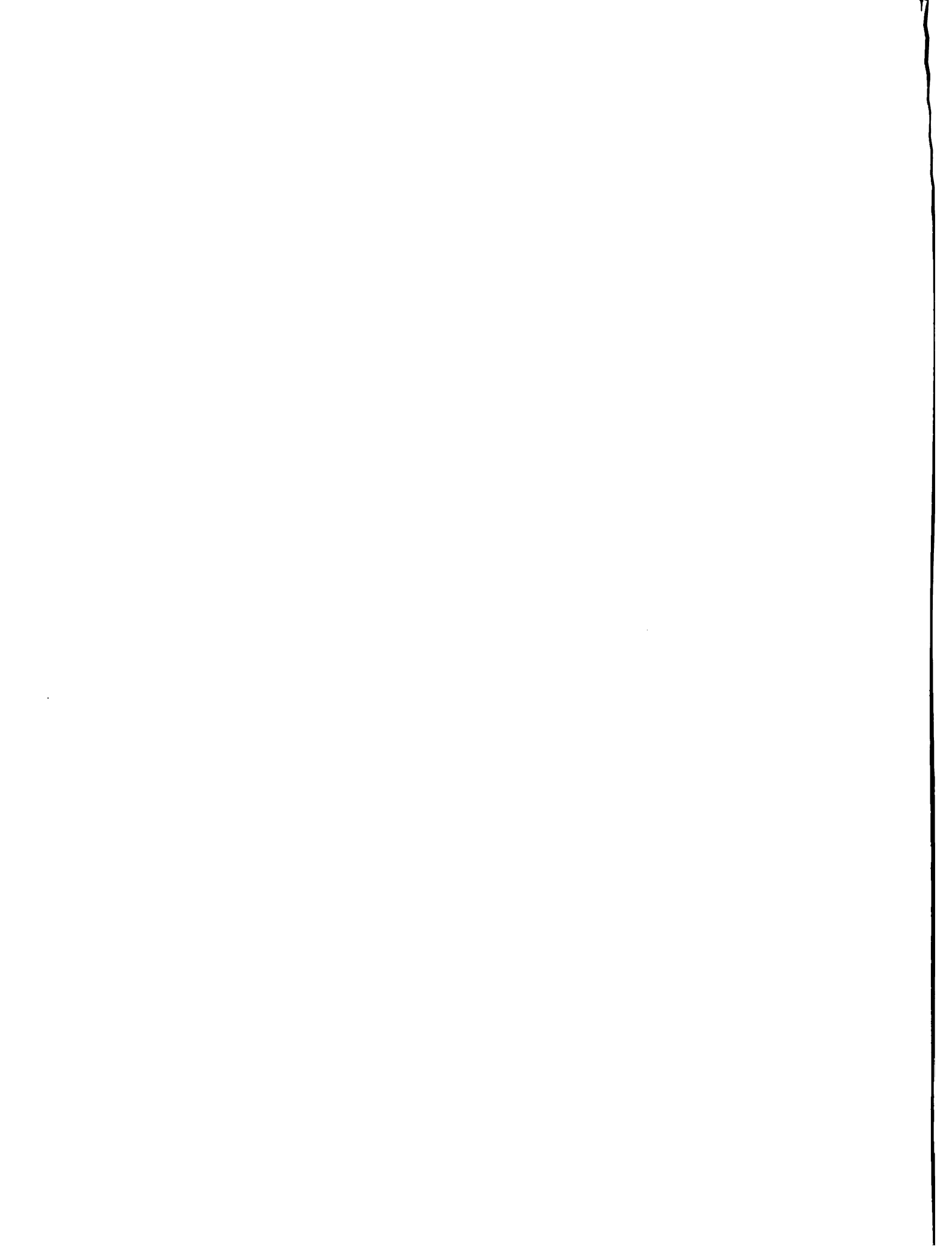


VIII. Location of the Center

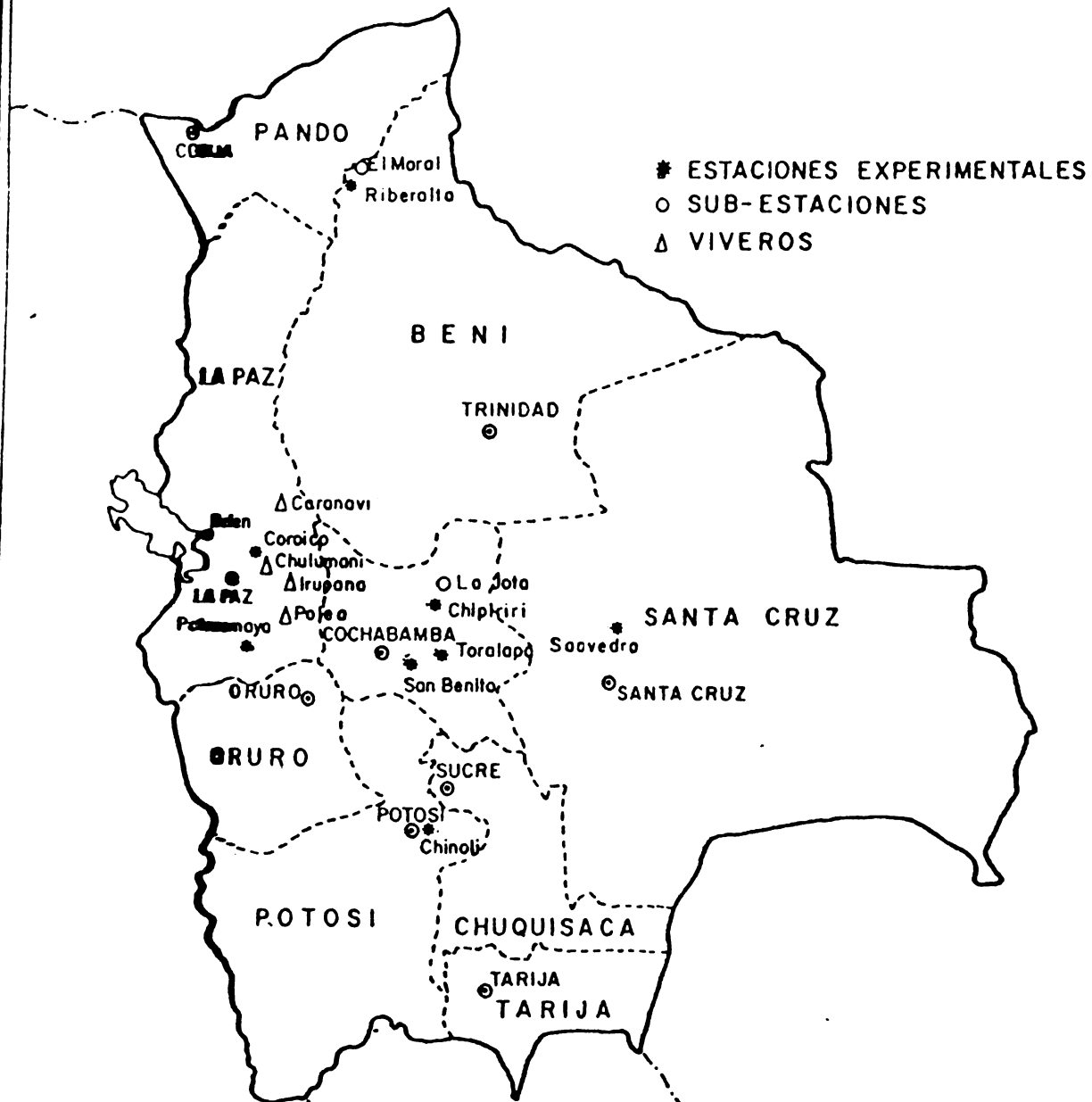
The Government of Bolivia (GOB) has offered to make available a portion (50 h or more if needed) of the Patacamaya station which is located at 101 Km on a good road from La Paz to Oruro. The station is situated at 12,000 feet (3789 m) altitude a.s.l. and at 67° 55' west longitude and 17° 15' south latitude. Annual rainfall varies between 240 - 415mm. Mean annual temperature is 9° C with 170 days of frost. Daily temperatures vary from subfreezing to 20° C.

Its soil is alluvial, shallow, sandy and gravelly with a calcareous hardpan at about 20 cm. It has a ph of 6.0-7.0 and is poor in nitrogen and organic matter. Soil and climatic conditions are essentially similar to those of the altiplano central in which it is located but does not encompass all of the environmental conditions in which Quinoa and other Andean crops are grown, but no single location is likely to achieve this. However a series of substations would also be available for regionally specific field trials. (See Fig. 2.)

The site provides adequate land area needed for buildings and research fields (See Fig. 3). The existing IBTA buildings would remain essentially as they are and would be used for IBTAs national research and training functions. Arrangements can be made for sharing vehicle repair facilities, and for some



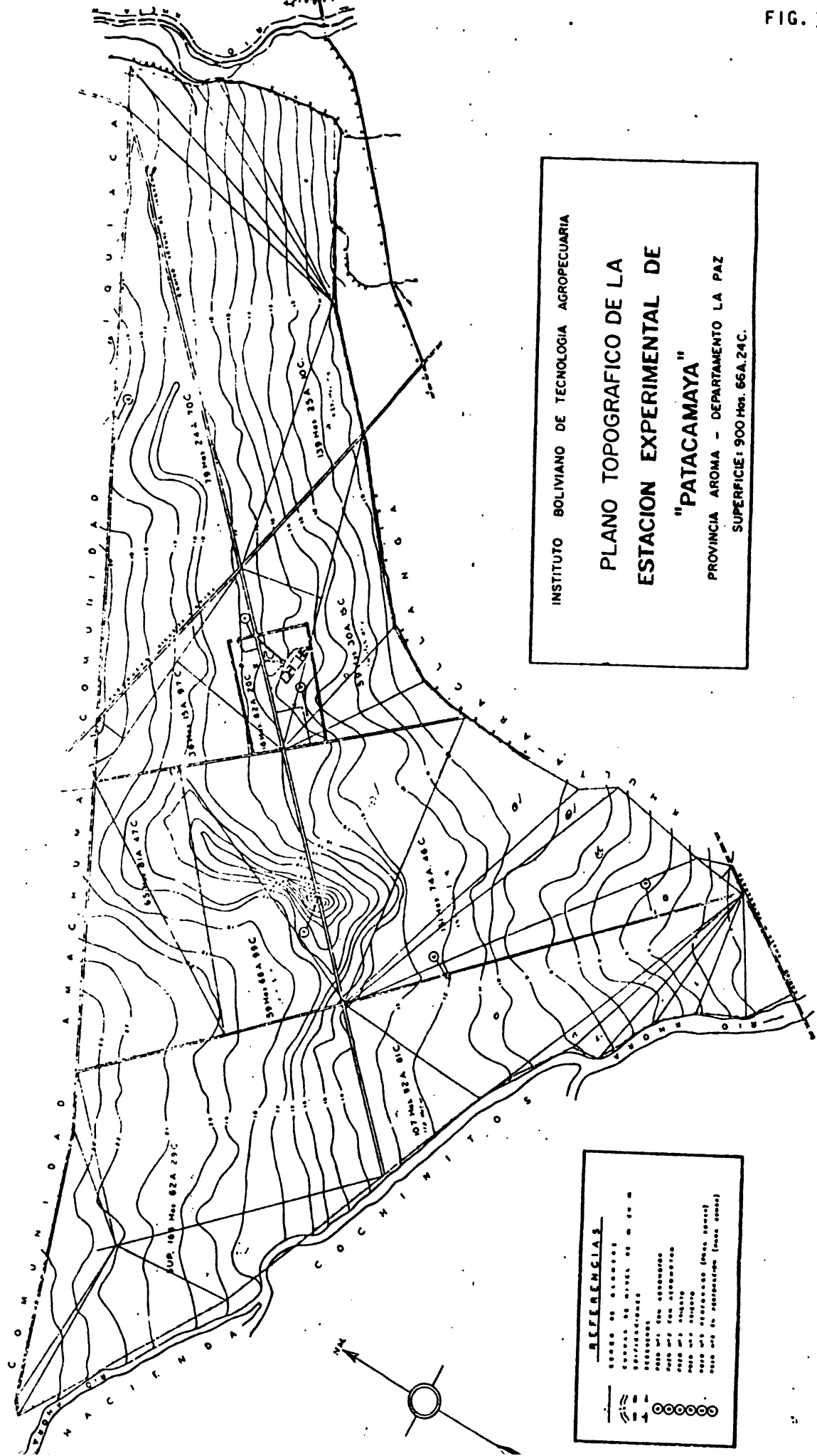
LOCALIZACION GEOGRAFICA DE ESTACIONES EXPERIMENTALES SUB-ESTACIONES Y VIVEROS DEL IBTA



★ ESTACIONES EXPERIMENTALES
○ SUB-ESTACIONES
△ VIVEROS

		<u>ESTACIONES EXPERIMENTALES</u>	<u>DEPARTAMENTO</u>
Saavedra	Sta. Cruz	Patacamaya	La Paz
Riberalta	Beni	Belén	La Paz
El Maral *	Beni	Coroico	La Paz
<u>VIVEROS</u>		Chinolí	Potosí
Chulumani	La Paz	San Benito	Cochabamba
Caranavi	La Paz	Toralapa	Cochabamba
Irupana	La Paz	Chipliriri	Cochabamba
Polea	La Paz	La Jota *	Cochabamba





INSTITUTO BOLIVIANO DE TECNOLOGIA AGROPECUARIA

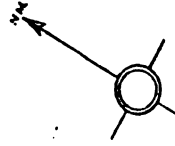
PLANO TOPOGRAFICO DE LA ESTACION EXPERIMENTAL DE "PATACAMAYA"

PROVINCIA AROMA - DEPARTAMENTO LA PAZ

SUPERFICIE: 900 Has. 66A.24C.

REFERENCIAS

- Línea de contorno
- Línea de nivel de m. n.m.
- Línea de drenaje
- Línea de ferrocarril
- Línea de carretera
- Línea de camino
- Línea de alambrado
- Línea de alambrado (para cercos)
- Línea de alambrado (para cercos)



services, ie. electrical and irrigation systems. The station would require the following:

1. surfacing of the access road from the town of Patacamaya to the station site;
2. an adequately designed and structured irrigation and drainage system including wells, pumps, canals and field roadways;
3. installation of public electrical lines of sufficient capacity to supply both the center and IBTA, including an emergency power system for operation of critical machinery and installations (germplasm storage, cell and tissue culture rooms, computers, etc.)
4. telecommunications capacity must be upgraded including the installation of telephone, FAX, telex and radio networks.
5. Protection of the research station site is essential and will require the construction of perimeter walls or fencing. A military station on one side provides some protection and this needs to be augmented on other sides. Post and barbed wire fencing, delineating the station grounds, is usually adequate to prevent trespassing. However, farmers should feel welcome and also responsible for the security of the station. This can be achieved by having frequent field days at the station.



**Table 12. Estimated Construction and Equipment Costs
for an Andean Center Patacamaya**

Type of facility	Approx. size (m2)	Cost	Cost of Construct.
		(m2) \$U.S.	\$U.S.
1. Laboratories <u>1/</u>	360	300	108,000
2. Adm. offices <u>2/</u>	120	250	30,000
3. Acct./Personnel <u>3/</u>	150	250	37,500
4. Documentation/ Publicat./Training <u>4/</u>	224	250	56,000
5. Outreach Prog. <u>5/</u>	60	250	15,000
6. Auditorium (optional)	900	300	270,000
7. Germplasm <u>6/</u> Long & Medium Term Cold Storage Unit	50	500	75,000
Work Area & Lab	80	250	20,000
Offices	40	250	10,000
8. Greenhouses <u>7/</u>	180	3 ea 50,000	165,000
9. Cafeteria <u>8/</u>	150	200	45,000
10. Classrooms <u>9/</u>	180	250	45,000
11. Dormitory/Trainees <u>10/</u>	360	250	90,000
12. Visit Scientist Quarters <u>11/</u>	800	300	240,000
13. Work Sheds <u>12/</u>	100	250	30,000
Seen Processing	100	200	20,000
14. Machinery Repair/ Storage <u>13/</u>	200	200	40,000
15. Deep Wells <u>14/</u>	2	(to be provided by GOB)	
16. Irrigation Drainage		(to be provided by GOB)	
17. Electrical System		(to be provided by GOB)	
18. Telephone /Comm. System		(to be provided by GOB)	
20. Fence and Security		(to be provided by GOB)	
21. Athletic Field and Recreation			10,000
22. Other Capital Requirements Costs			
Vehicles			150,000
Laboratory			300,000
Farm Machinery			250,000
Cafeteria			75,000
Office furniture			110,000
Computers & Office equipment			75,000
Machinery and equip. for Substations			<u>200,000</u>
			2,456,500
	Architect fees (15%)		325,000
	Supervision (5%)		216,000
			<u>2,997,500</u>

Footnotes to Table

- 1/ Laboratories include: laboratory and office space for soils, entomology, pathology, genetics, cell and tissue culture and passage ways.
- 2/ Offices include: Director, deputy, secretary, reception, Board room.
- 3/ Space includes: 2 offices, records offices secretarial.
- 4/ includes: 2 offices, library, publications and document preparation (does not include classroom.)
- 5/ Outreach includes: only 2 staff offices and one visitor
- 6/ Germplasm Unit includes: cold storage rooms, laboratories and work space, offices
- 7/ Greenhouses consider three prefabricated units @ 50,000 each, plus 15,000 installation costs.
- 8/ Dining Hall & Kitchen includes: two expandable dining sections, food storage and kitchen. Does not include kitchen and dining room equipment.
- 9/ Classrooms include: Two expandable salons and 10 cubicles
- 10/ Dormitories include: accommodations for up to 40 persons per section for men and women.
- 11/ Housing for visiting staff includes: four units for temporary senior visiting staff and four units for graduate students (2 single, 2 married) each. Does not include furnishings.

12 Work Sheds and Seed Processing includes: open and covered patios, seed storage rooms; does not include machinery.

13/ Machinery Shed include covered patio and closed storage.

14/ Deep wells including electric or diesel pumps and pump station.

X. Program Operations and Budget**Research at the Center**

The Center will have to establish crop research priorities for each of the specific program priorities. Tentatively, the suggested priority has been placed on quinoa (see Table 13). The related species Chenopodium pallidicaule (Kaniwa) could be included in this priority.

Initially, the Center should maintain a narrow focus on the first priority, however in order to justify the capital and operating costs in the Center, some work will need to be incorporated on the subsequent priorities. Such program expansion must be very carefully planned and should involve collaborative research with the NARIs.

An estimate of annual budget requirements is given in Table 14. Included are four administrative level and fourteen program level staff plus support staff. The Center would require an annual budget of approximately US\$2 500.000.

Table 13. Main Andean Native Crops
 (Source Tapia. M and N. Mateo) Modified.

	Approx. Crop Area (h) ^{1/}	Altitude (masl)	Tentative Research Priority
<u>Grains</u>			
Quinoa	60,000	0 - 3,900	1
Kaniwa	7,000	3,900 - 4,100	1
Amaranthus	550	0 - 3,000	3
Lupinus	4,300	1,500 - 3,800	2
<u>Tubers</u>			
Oca	34,400	3,000 - 4,000	4
Olluco	23,000	2,000 - 3,900	5
Mashua	6,000	2,800 - 4,000	6
<u>Roots</u>			
Yacon	300	0 - 3,000	-
Arracacha	400	0 - 3,000	-

^{1/} Estimates include available data for Peru, Ecuador and Bolivia and are subject to considerable error due to faulty reporting and/or the minor importance of the crop in some countries.

**Table 14. Estimate of the Recurrent Budgetary Requirements
(Annual \$U.S.)**

<u>Item</u>	<u>Number</u>	<u>Staff Cost 1/</u>	<u>Program Costs</u>
<u>Personnel</u>			
Administration			
Director	1	75,000	130,000
Executive Secretary	1	40,000	-
Personnel Dir.	1	30,000	-
Finance Office	1	30,000	-
<u>Research Program</u>			
Res.Dir.	1	50,000	-
Scientist	7	280,000	350,000
Documentation Spec.	1	40,000	50,000
Training Spec.	1	40,000	50,000
Sociologist	1	40,000	40,000
Germplasm Spec.	1	40,000	80,000
Seed Spec.	1	40,000	40,000
Exp. Sta. Manager	1	30,000	30,000
<u>Secretarial</u>			
Operators	2	14,000	-
Others (kitchen, household, etc.)	8	28,000	-
Field Laborers	20	52,000	-
<u>Program Related Costs</u>			
Outreach (Coop. Research)	-	-	200,000
Fuel	-	-	30,000
Electric	-	-	30,000
Repairs & Maintenance	-	-	40,000
Depreciation (Replacement)	-	-	50,000
<u>Contingency (5%)</u>			50,000
Sub-totals		829,000	1,170,000
GRAND TOTAL			1,999,000

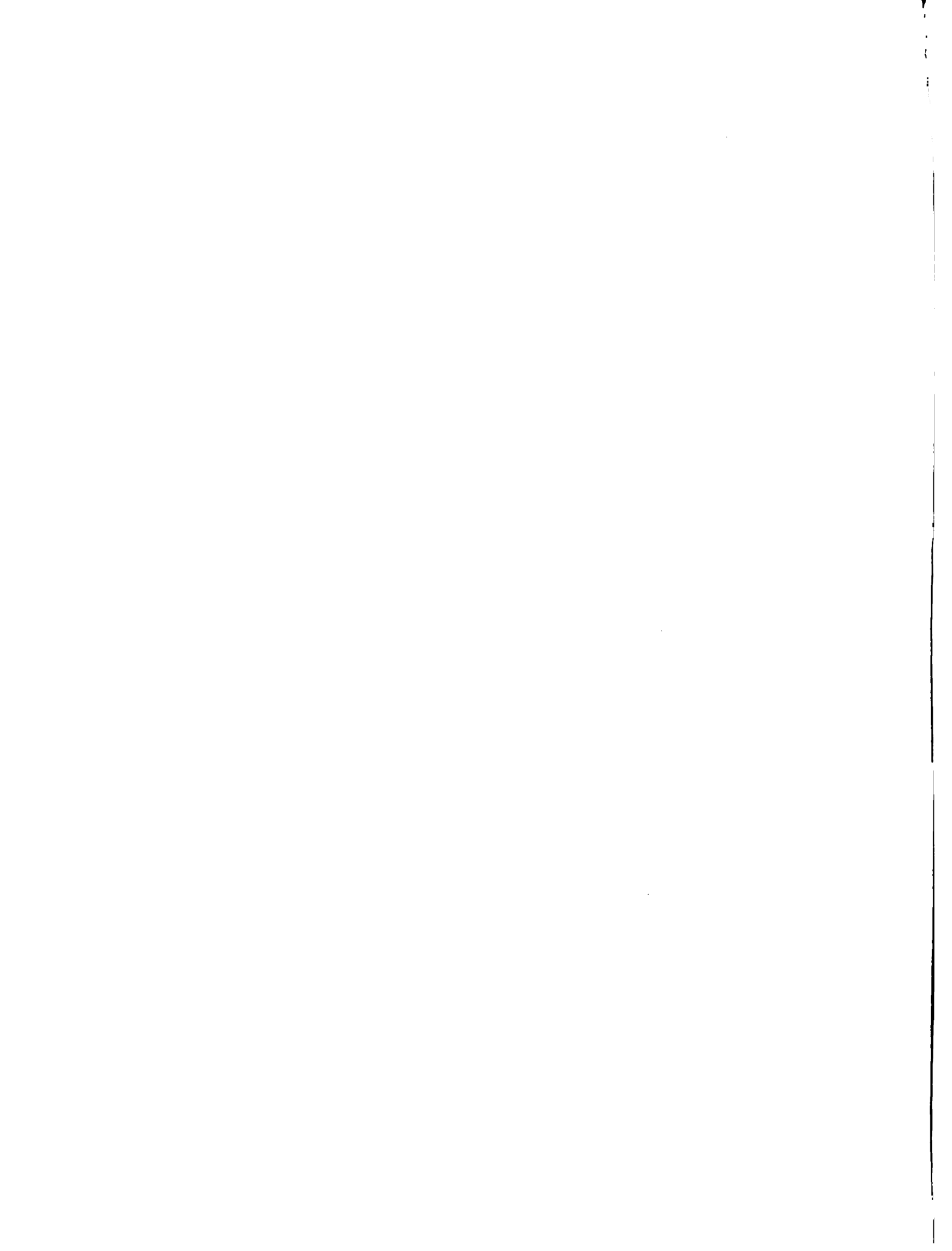
1/ Note: staff costs do not include retirement, insurance, nor relocation costs. The estimated salary cost of approximately \$900,000 U.S. should be doubled to cover these additional costs.



XI. Outreach and Cooperative Research

Several types of outreach and cooperative research are envisioned that are related to the Center programs.

1. Substation and on-farm research. This will be conducted by the Center in Bolivia. The NARIs will also have research activity at these levels.
2. Cooperative research with NARIs and other national institutions. The cooperative research projects should be directly related to the priority research program of the Center. Provision should be made in the Center budget to facilitate the execution of selected projects.
3. Human nutrition research is currently being conducted by nutrition institutes in the region. Both chemical and biological evaluations of new crop varieties should be conducted. The Center should establish close contacts with these programs and assist them in appropriate ways - for example provisions of samples for testing. Animal feeding studies should be similarly supported.
4. The Center should work closely with appropriate government and private agencies to promote market development and research. This should be one of the principal activities of the Center economist, in addition to the work on production economics.



The Center should have a strong outreach (cooperative) program. Special provision should be made in the core budget to partially support this activity. In addition, special project funding might be available to support particular cooperative research projects. Table 13 gives some indication of the current level of research in different NARIs. There is a critical need for operating funds in all NARIs.



Table 13. Indicative status of Research at NARIs 1/

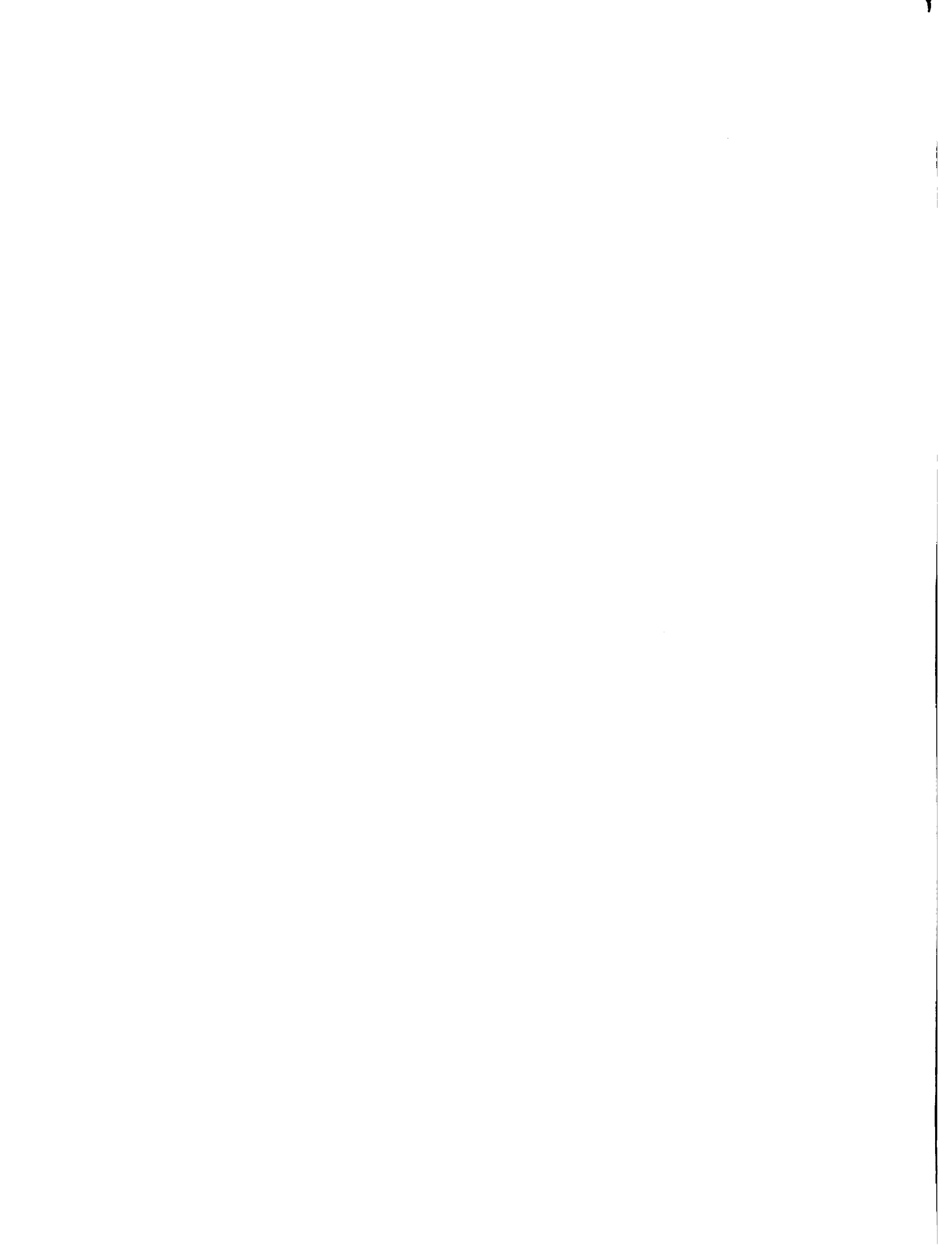
Item	Peru	Bolivia	Ecuador
<u>Scientists and</u>	18	8	4
Technicians			
<u>Research Program <u>2/</u></u>			
Plant Breeding	+	+	+
Agronomy	+	+	+
Plant Protection	+	+	-
Seed Production	+	+	+
Germplasm Conservation	+	+	+
Post Harvest Tec.	+	+	-
Socio-Economic Studies	-	+	-
Cooperative Res. (Univ.)	+	+	-
Res. Stations	15	12	1
Annual Budget <u>3/</u>	N/A	N/A	26,246

1/ data not available for Venezuela and Colombia.

2/ + indicates some level of activity

- indicates little or no activity

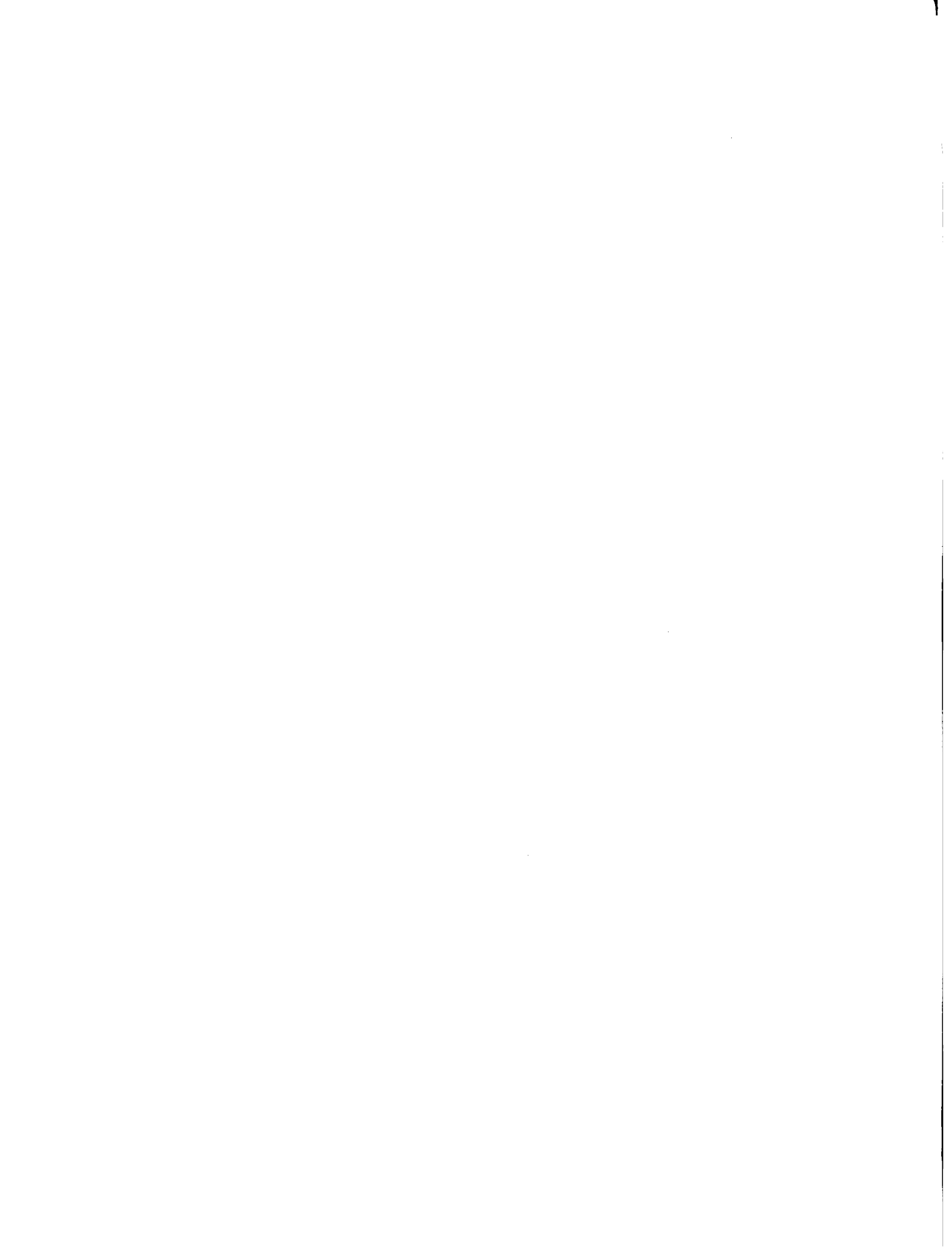
3/ includes funds from all sources



XII. Mechanisms for integrating an Andean Center Program with National Programs and with PROCINDINO

There are several mechanisms for establishing cooperation, collaboration and integration between and among the programs of the Andean Crop Center, the National programs (NARIs) and PROCINDINO. These include but need not be limited to:

1. Participation of NARIs leaders as members on the Board of Directors. The NARI leaders are now members of the Directive Council of PROCINDINO. By holding membership on the Board of Directors of the Andean Crop Center, there would be established automatically a direct linkage between the Center, the NARIs and PROCINDINO. Alternatively, the Executive Director of PROCINDINO, plus two or three of the NARIs Directors could sit on the Center Board.
2. Research scientist from the NARIs could spend several months, up to a year at the Center on rotational basis.
3. Specific research projects could be contracted to the NARIs from the Center.
4. The Center could hold the base germplasm collection of the Andean grains on behalf of the Andean countries and generally coordinate germplasm conservation activities. Germplasm in tissue culture might be held by NARIs or Universities.



5. The Director of the Andean Crop Center could be invited to participate in the Directive Council meetings of PROCIANDINO.

Some of these relationships are illustrated in Figure 4.

We must not lose sight of the fact that the most important programs are those at the country level. The PROCIANDINO assists in making NARI programs mutually supporting. The Center role would be to fortify the technological input in NARIs by conducting the more broadly applicable basic research which is beyond the means of NARIs. Technology transfer is facilitated by the PROCIANDINO mechanism. A high degree of interaction is needed to assure that all resources are utilized effectively and efficiently and also to assure that the results and benefits are maximized and shared.

The technical directors and scientists should be committed to rapid, forced pace development. For this reason it is essential that the technology delivery systems be strengthened simultaneously and integrally with the research system.

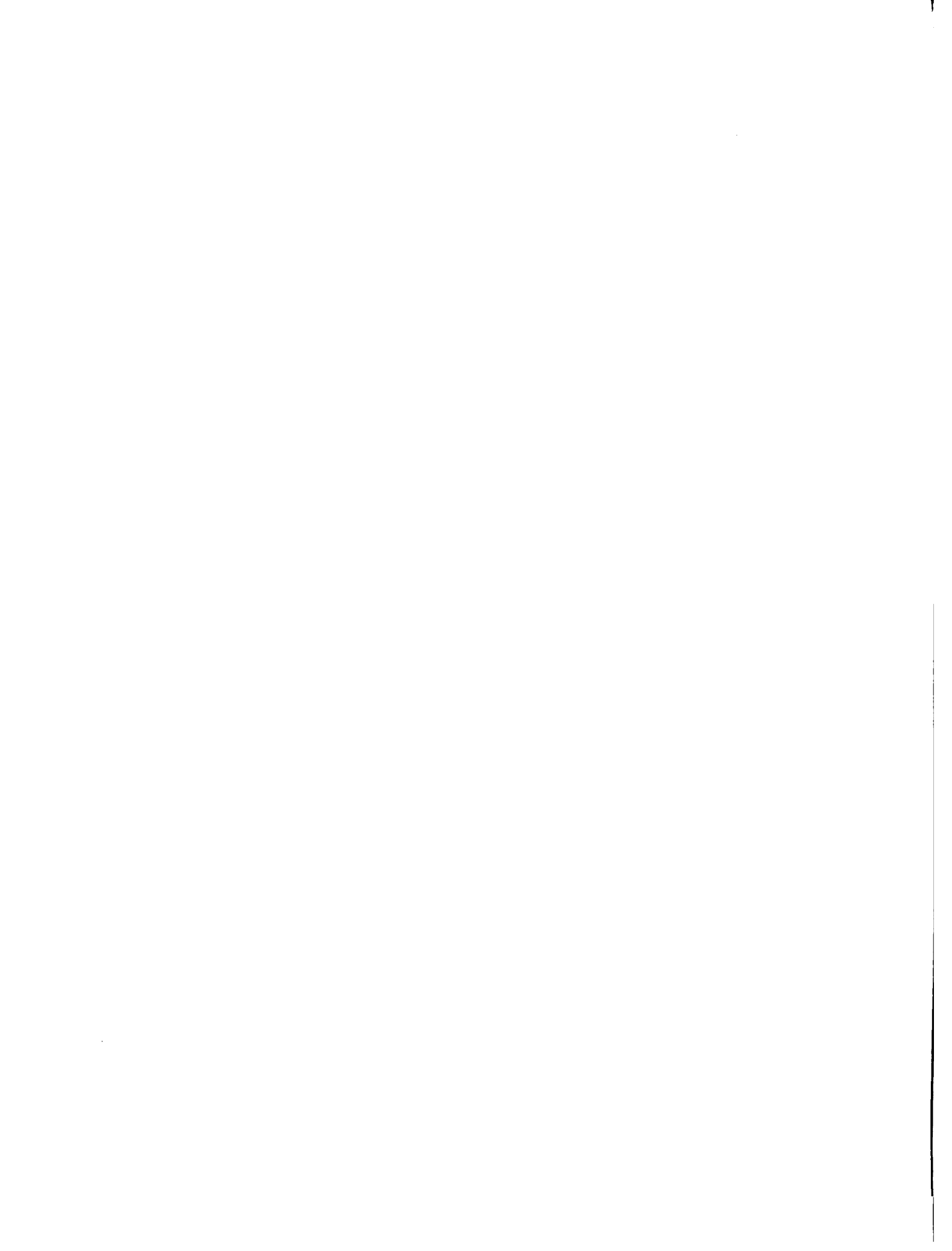
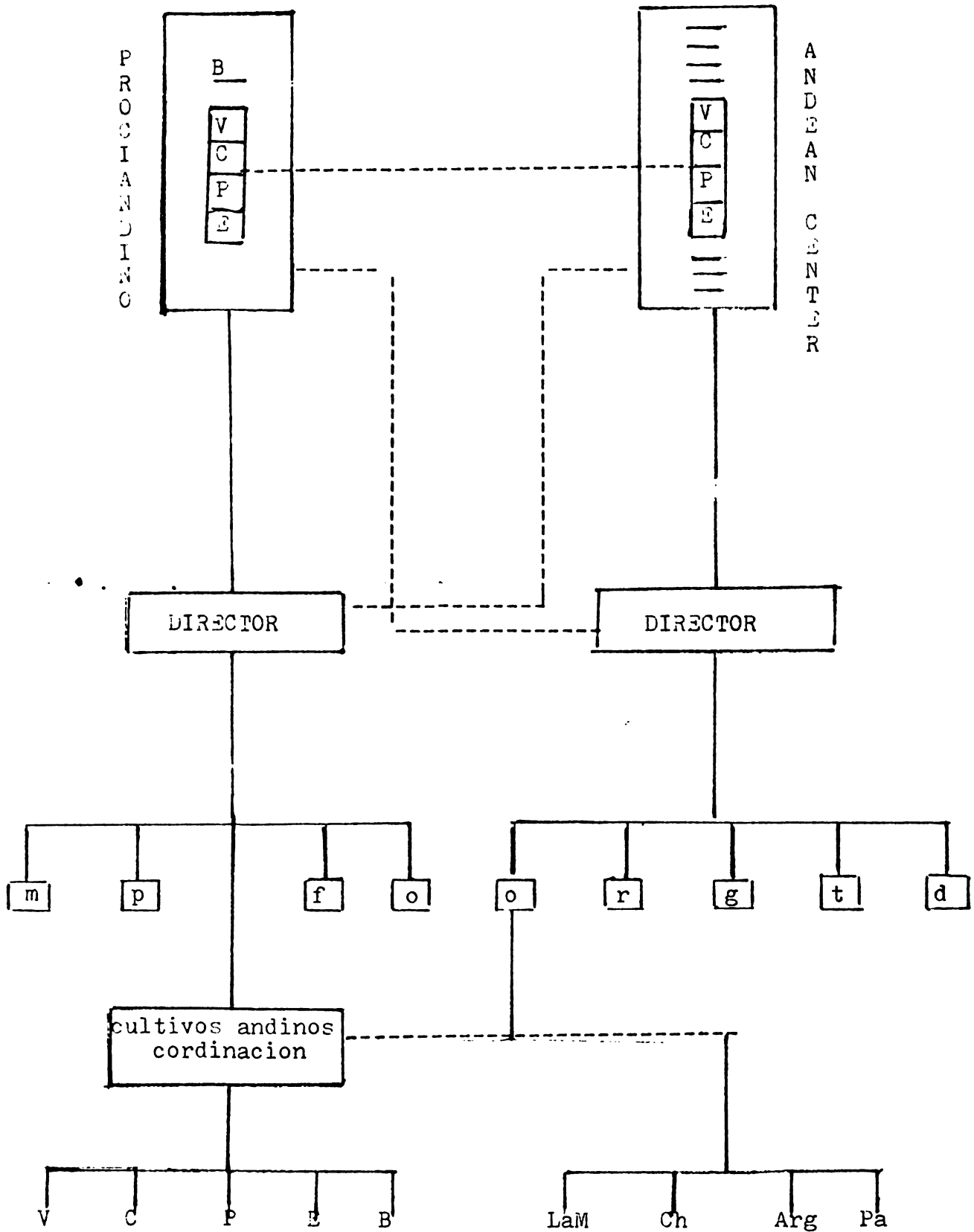
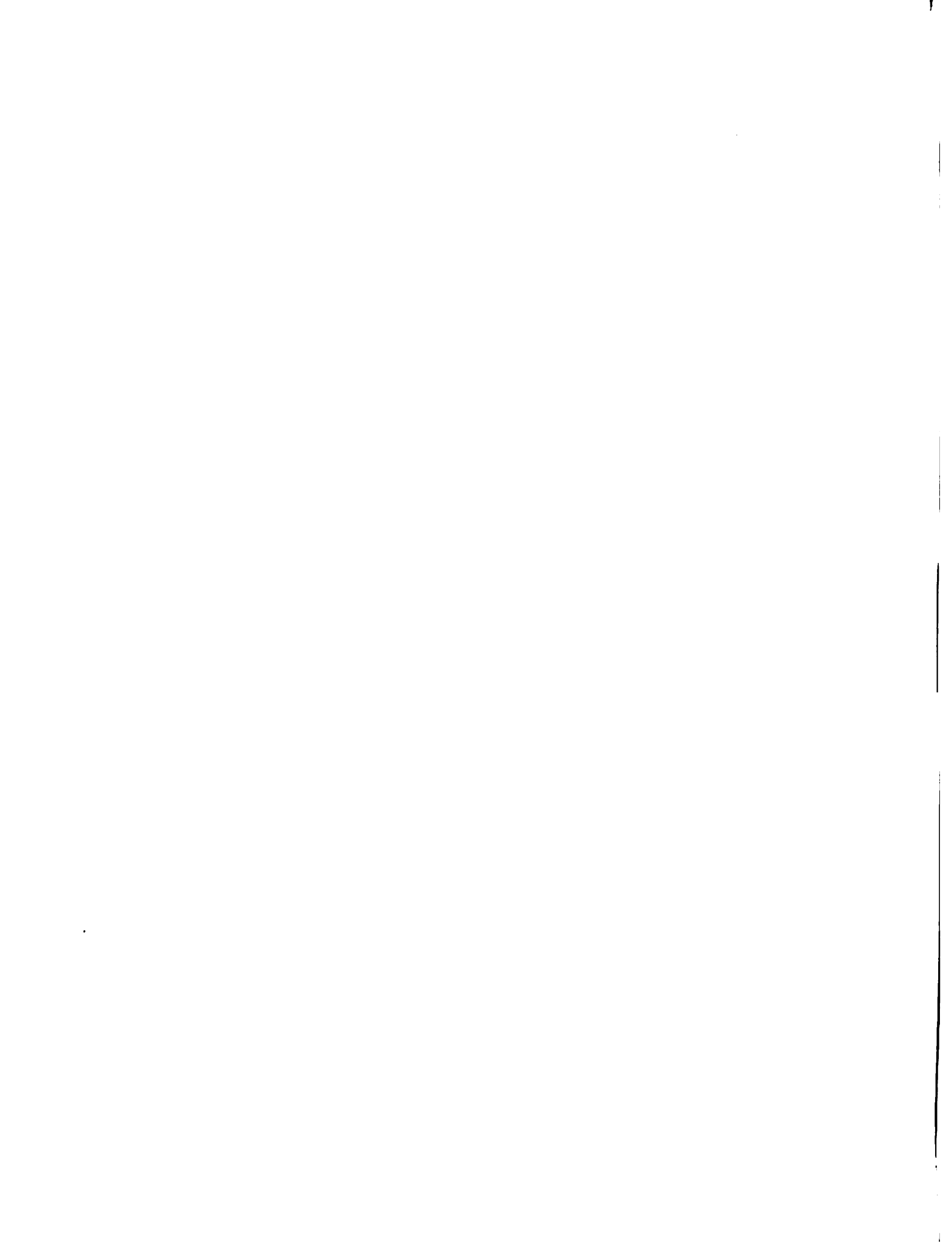


Fig. 4 Schematic illustration of linkages between PROCIANDINO, NARIS, ANDEAN CROP CENTER and other Institutions.





XIII. Possible contributions from participating countries and potential donors

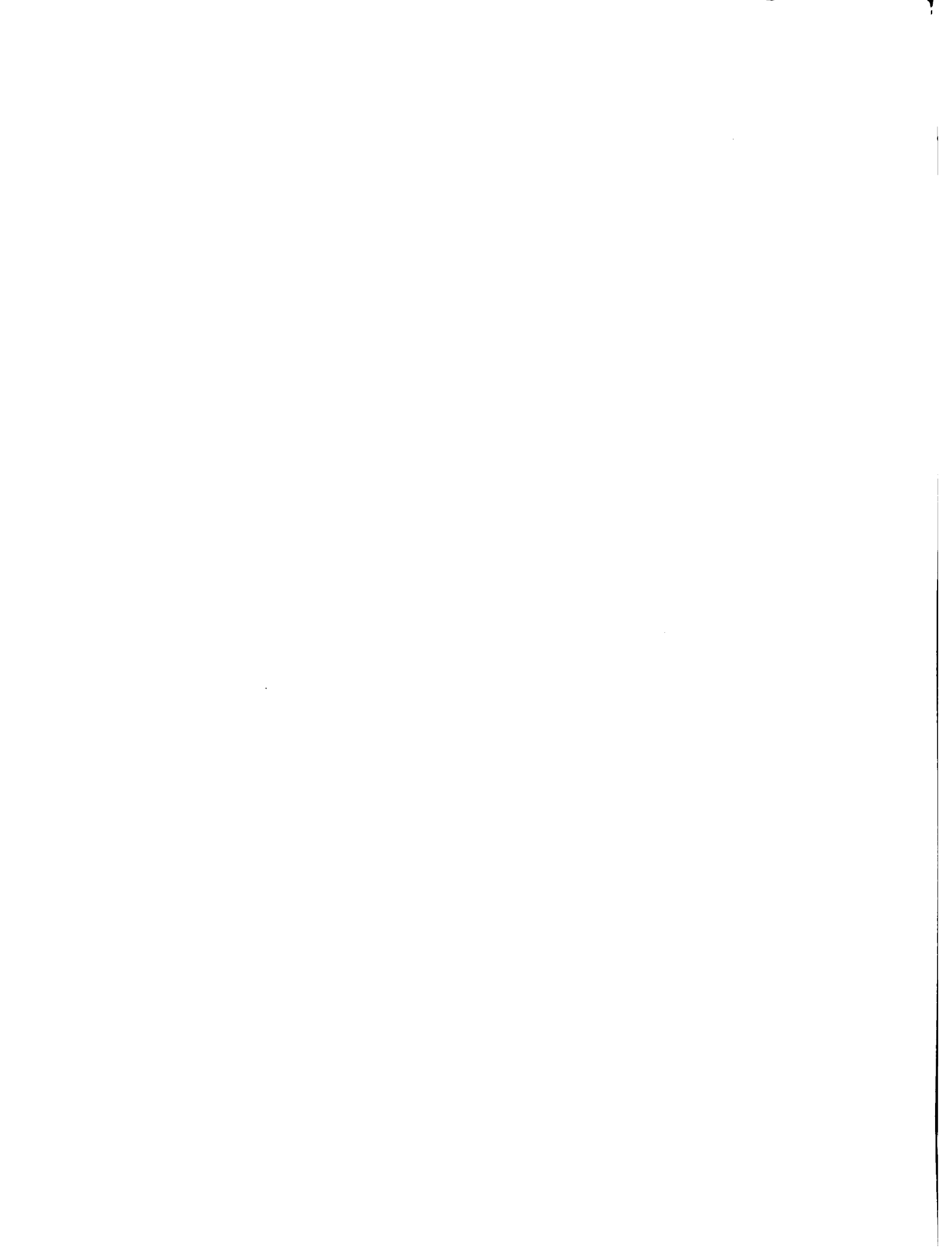
Participants Countries

All of the countries visited expressed a willingness to contribute to the program of the Center. The major contribution would be the persons and infrastructure needed for cooperative research programs.

It is possible that certain professional staff from the NARIs could be placed on loan to the Center at no cost to the Center. Most countries of the region have some staff, laboratories and field facilities. Although the countries expressed a desire to contribute financially toward the costs of the Center, such decisions cannot be made at this time. Nevertheless, the moral support which is very evident, should be matched by some financial commitment perhaps through the JUNAC.

Potential Donors

There appears to be widespread interest among bilateral and multilateral donors in the Andean region. There is an awareness among them of the need to find solutions to the poverty of this region. Although the Andean Center, by itself obviously is not the answer it could make a substantial contribution to the economies of the rural highland communities and should become a part of broader national and regional strategies for accelerating the capacity of the region to assist itself.



Should a decision be reached to establish an Andean Crops Center, high level officials, together with the Regional organizations such as IICA and JUNAC should meet individually and collectively with the donor community to seek their support for the Center.

XIV. Conclusions and Recommendations

The arguments for strengthening Andean crops research and development are more important today than ever before. In spite of the validity of these considerations in the past, no decisive action on any reasonable scale had been taken until the 1950s. Up until that time, other crop priorities, based on economic and political interests, resulted in the neglect of the Andean species.

Although only twenty plant species provide most of the world food supply many other species contribute very important components to the diet of people and satisfy their nutritional requirements. Many vegetable, condiment, spice, fruit, and nut species for example which may not be significant in terms of volume, compared to cereals or tubers but are important nevertheless. In addition, some species are very important in particular regions and ecosystems.

A number of the Andean crop species fall in those categories. They are important in local diets and are suited to

the particular environments of the Andean region. Except for the Solanum species, few others have been exploited very widely. They represent a very valuable genetic resource and potentially could contribute to the food production systems of other regions as well, either through selection, hybridization or gene transfer. In reality these species have proven their worth over more than 3000 years and have survived in part because of their critical importance to the Andean cultures. The many landraces that have been instinctively selected by the people of the region fit into very complex and sophisticated farming systems. These unique materials could be in danger of extinction unless steps are taken to collect, characterize, evaluate, conserve, and utilize them.

From a general perspective, it is possible to conclude:

1. Yields, productivity and in some cases total production of Andean crop species is on the decline.
2. The technical potential for increasing yields and land area in Andean crop species is considerable.
3. The major constraint to adoption of technology and increasing production is the lack of adequate market systems and demand, not the lack of technology.
4. Under appropriate market incentives, additional technology would be needed to satisfy market quality demand and to sustain efficient production systems.

5. Current technology generating and delivery systems are inadequate to sustain expansion in Andean crop systems.
6. Small research nuclei exist which could respond to meet technological development however they are poorly supported and lack adequate staff because they cannot retain well trained people.
7. Current networking activity is fragile and needs to be strengthened.
8. The creation of an International Center on Andean Crops is technically feasible, is socially and politically important, but from a global perspective, it is difficult to justify a fully operational International Center.

The relatively recent recognition of the value of these species has given rise to some research efforts aimed at understanding the economic, social and technical parameters of the Andean food crop species. While these efforts are limited and diffuse, they have been invaluable in establishing a basis for further expansion. Mechanisms for strengthening the research effort need to be developed.

In view of the foregoing it is recommended that:

1. the governments and private sector jointly undertake to determine the current and potential dimensions of the different market outlets for Andean crops and following this develop a comprehensive production/market strategy.

2. the nuclei of national research programs of Andean crops be strengthened as a first priority.
3. the region develop a formalized structure for networking among the national research groups by incorporating Andean crops in the PROCIANDINO program.
4. consideration be given to establishing an Andean Crops Research Center to function primarily as coordination center and to perform certain common functions for the region such as documentation, training and germplasm conservation.
5. the technology transfer systems of the several countries be strengthened especially to assist the rural communities to improve productivity of Andean crops.
6. Support and encouragement be provided to regional and international conferences to encourage participation of the international scientific community in the study and development of Andean crops species.
7. the work of donors and private voluntary agencies relating to Andean crops be better coordinated in each Andean country and regionally.

References

Many reference materials were consulted in the preparation of this report. No attempt is made to include the large bibliography available on the subject of Andean crop species, however some of the important reports and more general publications used for this report are listed below.

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TERMINOS DE REFERENCIA PARA EL APOYO DEL IICA A BOLIVIA SOBRE:

Informe sobre la Factibilidad para la creación del "Centro Internacional de la Quinua y Cultivo Andinos"

1. **INTRODUCCION**

Bolivia como país andino ha manifestado continuamente a sus países vecinos y a la comunidad internacional su interés por impulsar el desarrollo de cultivos y especies animales adaptadas a las condiciones ecológicas reinantes en las montañas altas andinas. En este sentido el Ministro de Agricultura y el IICA dentro de su estrategia para el Bienio 1990-1991 han acordado la realización de un estudio tendiente a conocer la viabilidad de establecer un centro internacional para el desarrollo del cultivo de la Quinua, tubérculos y otros cultivos andinos.

El IICA, tomando en cuenta la solicitud del gobierno boliviano, el carácter de multinacionalidad de la misma y con el ánimo de apoyar la diversificación de la producción agrícola, se ha comprometido a brindar la cooperación técnica para la iniciativa señalada. Este documento corresponde a los términos de referencia para el estudio de factibilidad para la creación del mencionado centro.

2. **ANTECEDENTES Y JUSTIFICACION:**

2.1 **Problema específico:**

El Ministerio de Asuntos Campesinos y Agropecuarios (MACA) de Bolivia, a través del Instituto Boliviano de Tecnología Agropecuaria (IBTA) realiza investigaciones en tecnología de quinua, tubérculos y otros cultivos andinos, específicos para regiones del altiplano, en la Estación Experimental Patacamaya. Los resultados obtenidos han permitido mejoras en la calidad genética de las variedades investigadas y en los técnicas culturales utilizadas, pero se estima que los resultados obtenidos son todavía insuficientes, por lo que sería conveniente desarrollar actividades adicionales que impliquen no sólo el esfuerzo en Bolivia sino aunar esfuerzos con otros países que dispongan conocimientos técnicos sobre los productos mencionados.

2.2 **Justificación:**

El MACA propone a los países del Area Andina la creación de un Centro Internacional de la Quinua y de Cultivos Andinos, que tengan como objetivos centrales efectuar investigaciones y desarrollar variedades mejoradas mediante la ejecución de programas específicos en zonas actuales y potenciales de producción. En ese sentido el Ministro del MACA planteó a la Comisión del Acuerdo de Cartagena durante el Quincuagésimoquinto Período de Sesiones Extraordinarias de la Comisión, la necesidad de elaborar un estudio dirigido a crear un Centro Internacional de la Quinua, Tubérculos y Raíces Andinas,



con sede en Bolivia, planteamiento de recibió el respaldo pleno de los otros Ministros. Asimismo, el Director General del Instituto, en la visita que realizó a Bolivia en febrero de 1990, firmó con el Ministro del MACA un Acuerdo Ratificatorio para ofrecer la cooperación técnica del IICA para la formulación de un estudio sobre el Centro Internacional de la Quinua, Tubérculos y Otros Cultivos Andinos (Anexo I).

En avance a esta iniciativa, el Gobierno de Bolivia ha considerado la posibilidad de transferir la Estación Experimental de Patacamaya como aporte para la creación de un Centro Internacional, que junto al aporte de organismos e instituciones de los restantes países del Area Andina, harán factible el funcionamiento del Centro. El Area Andina constituirá la región prioritaria para la influencia del Centro, aunque los beneficios puedan expandirse a otras regiones.

Se destaca que la acción del IICA contempla la cooperación enfocada hacia el fortalecimiento de la capacidad de investigación y de transferencia de tecnología de los países miembros. Tanto el Plan de Mediano Plazo como el Plan de Acción Conjunta de Reactivación establecen este mandato en el cual resulta significativa la cooperación a través de mecanismos multinacionales tal como lo planteará el Gobierno de Bolivia a través del Subsecretario de Desarrollo Agropecuario, en una comunicación dirigida al Representante del IICA en Bolivia (Anexo II).

3. PROPOSITO:

El propósito de este trabajo será el de preparar un estudio que conlleve a proveer conocimientos y criterios para evaluar la factibilidad técnica, política y socioeconómica de la creación y funcionamiento de un Centro Internacional de la Quinua y Cultivos Andinos, tomando en consideración las necesidades de investigación y transferencia de tecnología; la disponibilidad de recursos de los países del Area Andina para comprometer sus esfuerzos en el desarrollo de dicho Centro y el interés de la comunidad internacional para apoyar el desarrollo de dicha iniciativa mediante una posible vinculación para apoyar actividades concretas en un futuro.

4. PROCEDIMIENTO:

4.1 Estrategia Operativa

La Oficina del IICA en Bolivia, con apoyo de la Dirección del Programa de Generación y Transferencia, estarán encargadas de la coordinación de un equipo de trabajo que desarrollará las tareas requeridas. Dicho equipo estará conformado básicamente por un consultor nacional contratado específicamente por el MACA, que se encargará principalmente de recabar la información de base y parte de la información complementaria y por un consultor internacional

*International
support*



In Bolivia

Meeting at
MACA
2. Visit
Station
Visit to
Peru
Ecuador

contratado por el IICA, quien tendrá a su cargo la preparación del informe solicitado. La consultoría comenzará en Bolivia, contactando inicialmente al MACA en cabeza del Señor Ministro de Agricultura a fin de evaluar las condiciones de la Estación Experimental Patacamaya y sus posibilidades de convertirse en el futuro Centro Internacional de la Quinua y Cultivos Andinos. En esta primera tarea se contará con el apoyo de a Oficina del IICA en ese país y del IBTA. Posteriormente el consultor visitará a los Ministerios de Agriculturas e instituciones nacionales de investigación de los países del Area Andina que considere oportuno para obtención de información y contactos que permitan establecer las necesidades de investigación, transferencia e interés de los países en participar en la creación del Centro propuesto. A nivel del Programa PROCIANDINO los países más interesados en el tema han sido Bolivia, Ecuador y Perú.

El Programa II, como ya se ha mencionado, asistirá este proceso de estudio de factibilidad, contribuyendo a la conceptualización sobre las bases existentes y la viabilidad técnica para la creación del Centro Internacional, a través de un Especialista en la Sede Central, del Director del PROCIANDINO, y del Jefe del Proyecto Multinacional sobre Apoyo a la Organización y Administración de la Investigación y Transferencia de Tecnología localizado en Caracas. La participación de estos funcionarios a nivel de grupo, será convenida entre el consultor con el Director del Programa II, si ello fuese necesario. De lo contrario, los mencionados funcionarios colaborarán desde sus sedes de trabajo dando apoyo a la acción.

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4.2 Información a Obtenerse

El MACA de Bolivia a través del consultor nacional asignado para tal propósito y con el apoyo directo de la Dirección de Investigación del IBTA deberá proveer la información de base necesaria para el informe de factibilidad. Dicha información corresponderá a los siguientes aspectos:

4.2.1 Importancia y Producción de la Quinua y otros Cultivos Andinos

- a. Importancia socioeconómica de la Quinua y los principales cultivos andinos que serian cubiertos por el centro internacional a nivel país y subregionalmente;
- b. Datos sobre la producción de Quinua y otros cultivos andinos;
- c. Principales limitantes tecnológicos para la producción de dichos cultivos y la oferta existente para resolverlos;
- d. Estudios regionales, incluyendo la multiplicación de similla realizados por el IBTA y otras instituciones;
- e. Potencialidades para expandir horizontal (área) y verticalmente (productividad) la frontera agrícola con relación a dichos cultivos.

4.2.2 Capacidad Institucional

a. Programas de Investigación existentes en la Subregión y sus recursos; b. Profesionales investigadores y extensionistas relacionados directamente con los cultivos bajo estudio; c. Programas y/o Proyectos específicos de orden nacional y subregional existentes de apoyo a dichos cultivos; d. Facilidades institucionales en Bolivia y los demás países de la subregión para la realización de actividades internacionales de investigación. e. Interés y apoyo potencial con recursos de otros centros y organismos nacionales e internacionales.

Con base en la información anotada y otra que estime conveniente el consultor internacional, se preparará el informe que señalará la viabilidad de crear el centro internacional de una o varias estrategias similares que conduzca al fortalecimiento de la base tecnológica para la producción de dichos cultivos vía la cooperación internacional. Para ello es importantes tener en cuenta el hecho de la continuidad del PROCANDINO, el cual en su segunda etapa contempla por decisión de los países un Subprograma sobre cultivos alto-andinos y ganadería.

4.3 Desarrollo de la consultoría

El consultor internacional con el apoyo ya referido en la sección 3.3.1, preparará el informe final en un período no mayor de ocho (8) semanas siendo su presencia necesaria gran parte del tiempo en Bolivia, incluyendo la visita a los países andinos más interesados en el tema. El informe se podrá preparar en un proceso que conlleve tres etapas continuas y sucesivas: una, para realizar ajustes al diseño específico del estudio a realizar, la obtención de información y realizar las entrevistas a que hubiere lugar; la otra, para analizar la información y desarrollar el informe y una tercera, presentar finalmente el mismo al IICA y luego ante las autoridades bolivianas y si fuese del caso, a nivel de la comunidad internacional interesada en la problemática agropecuaria de los ecosistemas alto-andinos de la subregión andina.

Lo anterior es una propuesta y puede sufrir las modificaciones que a juicio del consultor internacional sean necesarias, pero tomado en el período de duración del trabajo y la fecha de su conclusión.

5. PRODUCTO FINAL

El producto final de la asesoría será un informe que dictamine la factibilidad de crear un centro internacional para el mejoramiento tecnológico de la quinua y los principales cultivos alto-andinos que contenga además datos sobre: a. Posible contribución del centro al mejoramiento del ingreso y bienestar del campesino mediante el incremento

de la producción y productividad de los cultivos andinos; b. Posible contribución a la ampliación y reforzamiento del comercio exterior de la subregión via dichos cultivos; c. Condiciones necesarias de índole político y de recursos tanto para la creación como la operación del centro en el corto, mediano y largo plazo.

6. **DURACION DEL ESTUDIO:**

8 semanas

7. **FECHAS DE INICIACION Y TERMINACION:**

Julio 30 y Septiembre 24 de 1990

8. **RECURSOS:**

Los recursos provendran de la partida de cooperación técnica coyuntural para preinversión de la Sede Central del IICA.



ESTATUTOS

STATUTES

DEL

OF THE

CENTRO INTERNACIONAL DE LA PAPA

INTERNATIONAL POTATO CENTER

(CIP)

(CIP)

CAPITULO PRIMERO

Naturaleza, Objetivos, Plazo y Domicilio

Art. 1°.- El Centro Internacional de la Papa (CIP) es una Asociación sin fines de lucro, de carácter científico, organizada de acuerdo con las leyes peruanas, con autonomía económica y administrativa, que goza de los derechos correspondientes, que son los que se señalan en estos Estatutos y a la que se le ha otorgado las exoneraciones tributarias a que se refiere el Decreto Ley No. 18708 del 29 de Diciembre de 1970, de conformidad con el Convenio de Cooperación Científica celebrado entre el Gobierno del Perú y la Universidad de Carolina del Norte, suscrito el 20 de Enero de 1971.

Art. 2°.- El propósito esencial del Centro es el de contribuir en todos sus aspectos al desarrollo de la producción de la papa en beneficio de los países en desarrollo para lo cual desarrollará las actividades internacionales que se enumeran el artículo siguiente.

Art. 3°.- El Centro tendrá los derechos que sean necesarios y asumirá las correspondientes obligaciones para llevar a cabo las actividades siguientes:

CHAPTER ONE

Nature, Objectives, Duration and Domicile

Art. 1.- The International Potato Center (CIP) is a non-profit entity of scientific nature with economic and administrative autonomy organized in accordance with Peruvian law, with legal rights as indicated in these By-laws to which tributary exonerations have been granted according to Law Decree No. 18708 of December 29, 1970, as per the Agreement for scientific cooperation between the Government of Peru and North Carolina State University signed January 20, 1971.

Art. 2.- The main purpose of the Center is to help contribute to the development of all aspects of potato production for the benefit of developing countries by engaging in the international activities listed below.

Art. 3.- The Center will have the necessary rights and will assume the corresponding obligations to carry out the following activities:



-) Ejecutar Programas de Investigación para contribuir al mejoramiento de la producción de la papa y otros tubérculos dentro del país, así como en el extranjero.
 - b) Coleccionar, mantener y distribuir germoplasma de modo que pueda ser utilizado en el país, así como en escala internacional.
 - c) Prestar asistencia en el desarrollo de instituciones afines que puedan ser establecidas en el Perú o con sede en otros países.
 - c) Adiestrar a los técnicos en papa, bajo la dirección de científicos de alto nivel.
 - e) Publicar y distribuir los resultados de la investigación que lleve a cabo.
 - f) Establecer un Centro de Información y organizar una Biblioteca especializada, incluyendo un herbario.
 - g) Organizar conferencias, reuniones, mesas redondas y seminarios, tanto nacionales como internacionales, relacionados con actividades de mejoramiento de la papa.
 - h) Participar en toda actividad de acuerdo con los objetivos del Centro.
- a) Conduct Research Programs to contribute to the improvement of potato production and other tuberous roots, both nationally and internationally.
 - b) Collect, maintain and distribute germ plasm in order that it may be used both nationally and internationally.
 - c) Provide assistance in the development of related institutions which might be established in Peru or headquartered elsewhere.
 - d) Train potato technicians under the leadership of high level scientists.
 - e) Publish and distribute research results obtained.
 - f) Establish an information Center and organize a specialized Library, including a herbarium.
 - g) Organize conferences, forums, round tables and seminars both nationally and internationally concerning potato improvement activities.
 - h) Participate in all other activities related to the goals of the Center.

Art. 4°.- El plazo de duración del Centro es indefinido, pudiendo cesar en sus actividades cuando así lo acuerde la Junta Directiva, debiéndose en tal caso proceder a liquidar sus fondos y demás bienes, con sujeción a lo dispuesto en el Art. 16° de estos Estatutos.

Art. 5°.- El Centro tiene sede legal en la ciudad de Lima, Perú y podrá establecer dependencias o programas en cualquier otro lugar de la República o en el extranjero, cuando sea necesario.

CAPITULO SEGUNDO

Dirección y Administración

Art. 6°.- El Centro estará bajo la dirección de una Junta Directiva, compuesta por un máximo de 10 miembros, de los cuales no más de dos (2) serán de un país determinado, con la excepción del Director General.

La composición de la Junta incluirá dos (2) representantes del país sede, uno propuesto por el Ministerio de Agricultura y el otro propuesto por la Universidad Nacional Agraria; cuatro (4) representantes seleccionados entre los científicos, de las ramas agrícolas y de educación, de zonas donde se desarrolla el cultivo de la papa, designados por los miembros en actividad de la Junta Directiva. Los representantes propuestos

Art. 4.- The time of duration of the Center is indefinite and it may terminate its activities when the Board of Trustees so indicates, proceeding in such a case to liquidate its funds and other property, as stated in Art. 16 of these statutes.

Art. 5:- The Center's legal headquarters is in Lima, Peru, and it may establish dependencies or programs in other areas inside the country or abroad as necessary.

CHAPTER TWO

Direction and Administration

Art. 6.- The Center shall be under the direction of a Board of Trustees formed by a maximum of 10 members of which no more than two (2) shall be of the same country, with the exception of the Director General.

The Board of Trustees shall include two (2) representatives of the host country, one proposed by the Ministry of Agriculture and the other proposed by the National Agrarian University; four (4) representatives selected from among the scientists of both agricultural and educational branches, from areas involved in potato improvement designated by the active members of the Board of

Por el Grupo Consultivo de Investigación Agrícola Internacional; siendo el décimo integrante de la Junta el Director General del Centro que sirve de manera permanente. Todos los nuevos miembros serán elegidos por la Junta Directiva.

Los miembros de la Junta a excepción del Director General prestarán sus servicios por un período de tres años y podrán ser re-elegidos por un período adicional de otros tres años.

Después de dos períodos de servicio un miembro podrá ser nuevamente elegido en la Junta después de dos años.

Para asegurar continuidad en la política y funcionamiento de la Junta, los miembros prestarán sus servicios en períodos escalonados. Esta medida no prohíbe la re-elección para un segundo período de ningún miembro de la Junta Directiva inicial.

El sistema de períodos escalonados estará establecido, asignando al azar a los miembros de la Junta que prestan sus servicios al 20 de enero de 1973 por período de uno, dos y tres años. Los miembros que deberán prestar sus servicios por un período de un año, los continuarán prestando hasta las dos próximas reuniones anuales consecutivas, aquellos que deberán hacer por un período de tres años, hasta las próximas 4 reuniones anuales

Trustees; three (3) representatives shall be proposed by the Consultative Group on International Agricultural Research. The tenth member of the Board of Trustees shall be the Director General of the Center who serves ex-officio. All new members are to be elected by the Board of Trustees.

Members of the Board except the Director General shall serve for three years and may be re-elected for an additional three-year term.

After serving two terms a member may again be elected to the Board after an absence of two years.

To insure continuity of Board policies and operations, members shall serve staggered terms. This provision does not prohibit re-election to a second term of any member of the original Board.

The system of staggered terms shall be established by assigning by random choice the members of the Board serving until January 20, 1973 for one, two and three year periods. Members who are to serve a one-year period, will continue in service until the next two annual meetings those that are serving for a two-year term, through the next three consecutive annual meetings and those serving meetings and those serving for a three-year term through the next four consecutive annual meetings.

Las vacantes en la Junta aún no ocupadas al 20 de enero de 1973 serán asignadas por períodos de modo que se pueda mantener un balance de miembros en la Junta, que tengan período de servicios de uno, dos y tres años respectivamente.

La elección de un nuevo miembro de la Junta para reemplazar a uno que se retira, o la re-elección de un miembro elegible, tendrá lugar en la reunión anual que precede a la terminación del período en mención. Cuando un miembro nuevo es elegido o re-elegido, el nuevo período consistirá en tres reuniones anuales siguientes a su elección, excepto cuando surge una vacante porque un miembro de la Junta no puede completar su período esta debe llenarse no más tarde que la siguiente reunión de la Junta de acuerdo con el reglamento que se aplica a la vacante. Los miembros que son elegido para completar un período incompleto se les considera como si hubieran prestado sus servicios por un período completo pero son considerados para una re-elección por un período completo de tres años.

Art. 7°.- La Junta Directiva deberá elegir entre sus miembros a un Presidente y un Secretario que prestarán sus servicios por un período de dos años y cada uno de los cuales podrá ser re-elegido por dos años adicionales.

The vacancies of the Board of Trustees not filled before January 20, 1973 shall be assigned by periods in order to maintain a balance of members of the Board, that have a service period of one, two and three years consecutively.

The election of a new member to the Board to replace a retiring member, or the re-election of an eligible member, shall take place at the annual meeting preceding the expiration of the incumbent's term. When a new member is elected or re-elected, the new period shall be for three annual meetings following the election, except that when a vacancy occurs in an unexpired term of a Board member, it shall be filled no later than the following meeting of the Board according to the rule of election that applied to the vacant position. Members elected to complete an unexpired term shall be regarded as having served a full term but are eligible for re-election to a full three-year term.

Art. 7.- The Board of Trustees shall elect a Chairman and a Secretary from among its members, to serve for a two-year term and each of whom may be re-elected for two additional years.

En ausencia del Presidente, el Secretario de la Junta se desempeñará automáticamente como Presidente. En caso que el Presidente no pueda completar su período, la Junta Directiva deberá elegir un nuevo Presidente en la próxima reunión anual.

Cada miembro de la Junta tendrá un voto excepto cuando se especifique lo contrario, y todas las decisiones serán por simple mayoría de votos de los miembros según lo especificado en el Art. 8°.

Art. 8°.- La Junta se reunirá por lo menos una vez por año calendario, en el lugar y fecha acordada por la Junta.

El Presidente convocará a reuniones regulares de la Junta previa consulta con el Secretario y el Director General.

Para tomar decisiones se necesitará un quorum que consistirá en la mayoría de sus miembros (la mitad del total de los miembros más uno) a excepción de lo previsto en el Art. 16° y excepto cuando la primera convocatoria de una reunión no resulta en la participación de la mayoría necesaria en cuyo caso una segunda convocatoria tendrá lugar y la Junta se reunirá y podrá tomar decisiones en la base de la mayoría del número de miembros que participan en la reunión.

In the absence of the Chairman, the Secretary of the Board shall automatically act as Chairman. If a Chairman cannot complete his term as Chairman, the Board of Trustees at its next annual meeting shall elect a new Chairman.

Each member of the Board shall have one vote and except where specified to the contrary, all decisions shall be decided by a simply majority of the votes of the members as specified in Art. 8.

Art. 8.- The Board shall meet at least once each calendar year at a time and place designated by the Board.

Regular meetings of the Board of Trustees shall be convened by the Chairman in consultation with the Secretary and the Director General.

A quorum for decisions shall be a majority (one half of the total number plus one) of the members except as provided in Art. 16 and except when the first convocation of a meeting does not result in the participation of the normal majority in which case a second convocation will take place and the Board will meet and be able to take decision on the basis of a majority of the number of members participating in the meeting.

primera convocatoria se dará un aviso de treinta días por escrito a los miembros de la Junta, antes de cada reunión regular. Diez (10) días de aviso, preferentemente por cable se dará a las reuniones especiales. Una segunda convocatoria necesitará un (1) día de aviso.

Las deliberaciones y acuerdos que se adopten en la reunión de la Junta serán registradas en un Libro de Actas, tanto en castellano como en inglés y serán firmadas por el Presidente y el Secretario de la Junta.

El Secretario hará circular un borrador de las Actas, entre los miembros que asistieron a la reunión, dentro del término de treinta días y los miembros harán sus observaciones y comentarios por escrito dentro de un plazo de otros treinta días.

Después que el Secretario ha recopilado las observaciones de los diversos miembros presentes en la reunión, las Actas serán reproducidas y circuladas entre los miembros de la Junta.

Art. 9°.- La Junta tendrá las siguientes responsabilidades:

Revisará y dará las pautas necesarias para dirigir la política de las actividades del Centro, revisará anualmente las condiciones

In first convocation, a thirty-day written notice shall be given to the members of the Board prior to each regular meeting. Special notice of 10 days, preferably by cable, shall be given for special meetings. A second convocation shall require one day notice.

Considerations and agreements adopted at the meetings of the Board shall be registered in a Minutes Book, both in Spanish as well as in English and shall be signed by the Chairman and the Secretary of the Board.

The Secretary shall circulate a draft of the minutes among the members who attended the meeting within a thirty day period, and the members shall present their comments and observations in writing within a fixed period of another thirty days.

Once the Secretary has received the observations and comments of the various members present, the minutes shall be duplicated and circulated among the members of the Board.

Art. 9.- The Board shall assume the following responsibilities:

Review and give policy direction to the Center's activities; review annually the financial condition; approve the

financieras; aprobará el número y la organización del personal profesional; y revisará y evaluará los informes de avance así como los informes anuales regulares presentados por el Director General.

La Junta podrá modificar los Estatutos en una reunión anual o en cualquier reunión especial solicitada para tal fin de acuerdo con el Art. 8°. Cualquier miembro de la Junta, treinta (30) días antes de la reunión podrá proponer cambios de los Estatutos y el Director General, después de referir el asunto al Presidente de la Junta, hará circular las propuestas de cambios entre los miembros. Los cambios necesitarán la aprobación de 2/3 la mayoría de los miembros que participen y voten.

Art. 10°.- La Junta nombrará al Director General del Centro y al Director General Asunto y aprobará al Director de Investigación así como al Director de Investigación Regional y Entrenamiento y determinará sus funciones y períodos de servicio.

Art. 11°.- La Junta tendrá un Comité Ejecutivo compuesto por el Presidente, el Secretario de la Junta y el Director General del Centro, quienes se reunirán regularmente de acuerdo a las necesidades, en lugares decididos por sus miembros.

number and organization of professional positions, and review and evaluate progress reports as well as the regular annual reports submitted by the Director General.

The Board may modify the By-laws at an annual meeting or at any special meeting called for that purpose, as per Art. 8. Any member of the Board, 30 days prior to the meeting, may propose changes in the By-laws, and the Director General, after discussing the possible changes with the Chairman of the Board shall circulate the proposed changes among its members. Modifications shall require approval of 2/3 majority of the members participating and voting.

Art. 10.- The Board shall name the Director General and the Deputy Director General of the Center and shall approve the Director of Research as well as the Director of Regional Research and Training and shall determine their function and terms of office.

Art. 11.- The Board shall have an Executive Committee composed of the Chairman, the Secretary of the Board and the Director General of the Center, which shall meet from time to time as deemed necessary at locations determined by its members.

Las funciones del Comité Ejecutivo serán determinadas por medio de un acuerdo o resolución de la Junta. Las Actas de las reuniones del Comité Ejecutivo serán registradas y firmadas por sus miembros y las tendrá el Secretario de la Junta.

La Junta tendrá un Comité Financiero compuesto por los miembros del Comité Ejecutivo más un miembro adicional designado por la Junta en el momento de elección de sus miembros.

La Junta tendrá un Comité de Programa que será nombrado en la elección anual de sus miembros.

La Junta podrá constituir otros comités ya sean permanentes o ad-hoc como sea necesario.

Art. 12°.- El Director General es el representante legal del Centro. El o en caso de incapacidad, el Director General Adjunto firmará todas las escrituras, contratos, y otros documentos legales del Centro dentro de las condiciones acordadas por la Junta, dirigirá y administrará directamente los asuntos del Centro; nombrará y cesará al personal excepto los indicados bajo el Art. 10° e informará a la Junta sobre los cambios del personal así como sus nuevos miembros.

The functions of the Executive Committee shall be determined by means of an agreement or by resolution of the Board. The Minutes of the meetings of the Executive Committee shall be recorded and signed by its members and will be kept by the Secretary of the Board.

The Board shall have a Finance Committee composed of the members of the Executive Committee plus one additional member designated by the Board at the time of election of officers.

The Board shall have a Programme Committee to be named at the annual election of officers. The Board shall constitute such other committees permanent or ad-hoc as necessary.

Art. 12.- The Director General is the legal representative of the Center. He or in case of his incapacity the Deputy Director General shall sign all deeds, contracts, agreements, and other legal documents of the Center; shall directly manage and administer the affairs of the Center; shall name and remove staff except those indicated in Art. 10, and shall inform the Board of staff additions and changes.

El Director General presentará a la Junta Directiva los planes e informes sobre el desarrollo de los programas y será responsable ante la Junta de todas las actividades del Centro.

The Director General shall submit to the Board of Trustees the plans and reports of the development of programs and shall be responsible to the Board of Trustees for all activities of the Center.

El Director General podrá delegar al Director General Adjunto sus responsabilidades y autoridad como lo considere conveniente para una administración efectiva del Centro. Esta delegación deberá ser autorizada por escrito e informada a la Junta.

The Director General shall be able to delegate to the Deputy Director General such responsibilities and authority as he deems appropriate for the effective administration of the Center. Such delegations shall be authorized in writing and reported to the Board of Trustees.

CAPITULO TERCERO

CHAPTER THREE

Convenios y Exoneraciones

Agreements and Privileges

Art. 13° .- El Centro tiene facultad para cumplir sus objetivos y para llevar a cabo ésto, como se indica en el Art. 2°, podrá:

Art. 13.- The Center has authority to carry out its objectives and in order to do so, as indicated in Art. 2, it may:

- a) Aceptar donaciones, legados, herencias y cualquier otro tipo de contribuciones que puedan aumentar o consolidar sus fondos.
- b) Ejecutar operaciones de crédito para el mejor desarrollo de sus actividades, siempre y cuando esté en capacidad de reunir los requisitos legales y económicos para llevar a cabo dichas transac-

- a) Accept donations, legacies, inheritances, and other contributions which might increase or consolidate its funds.
- b) Carry out credit transactions for the better development of its activities, provided that it be in a position to meet the legal and economic requirements for these transactions.

c) Adquirir la propiedad real y personal de toda clase de bienes, muebles e inmuebles que requiera para llevar a cabo sus actividades.

d) Además, ejecutar todos los actos y acuerdos, contratos u operaciones, así como otorgar todos los documentos convenientes o necesarios para cumplir con los fines del Centro.

Art. 14°.- De acuerdo al Convenio de Cooperación Científica firmado por el Gobierno Peruano y la Universidad de Carolina del Norte el 20 de enero de 1971, aprobado por Decreto Ley No. 20025 del 22 de Mayo de 1973 y lo dispuesto en el Decreto Ley No. 18708 del 29 de diciembre de 1970; el Centro gozará a los siguientes privilegios:

a. Derecho para importar libre de toda clase de impuestos el equipo y los vehículos necesarios para el establecimiento y operación de sus programas, incluyendo maquinaria, equipo de laboratorio y materiales.

b) La exoneración de impuestos mencionada en el párrafo (a), solamente es válida para las instalaciones y maquinarias, cuando éstas sean dedicadas para los fines científicos del Centro y deberá incluir exoneración de impuestos de las operaciones de venta de productos comerciales (papa),

c) Acquire the real and personal property necessary to carry out its activities.

d) In addition, perform all acts and execute all agreements, contracts or operations as well as sign all suitable and necessary documents to carry out the Center objectives.

Art. 14.- As per the scientific cooperation agreement signed between the government of Peru and North Carolina State University on January 20, 1971, approved by Decree Law No. 20025 on May 22, 1973, and as indicated by Decree Law No. 18708 of December 29, 1970, the Center shall have the following privileges:

a) The right to import free from all taxes the equipment and vehicles necessary for the establishment and operation of its programs, including machinery, laboratory equipment and materials.

b) The tax exemptions mentioned in (a) above, are only valid for installations and machinery, when used for scientific goals of the Center and shall include tax exemption on the sales of commercial products (potatoes), used vehicles, etc.

- c) Autorización para el libre tránsito de semillas y material genético dentro y fuera del Perú, de acuerdo con los reglamentos de sanidad peruana.
- d) Los científicos extranjeros que presten servicios en el Centro estarán exonerados del pago de impuestos a la renta, así como de derechos de aduana y demás impuestos a la importación que recaigan sobre sus efectos personales cuando ingresen al país de acuerdo con las leyes peruanas.
- c) Authorization for the free movement of seeds and genetic materials inside and out of Peru, according to Peruvian sanitary regulations.
- d) All non-Peruvian scientists working for the Center shall be exempted from payment of income taxes as well as duty and other importation taxes on their personal belongings when entering the country, as per Peruvian laws.

CAPITULO CUARTO

Fiscalización y Liquidación

Art. 15° .- La revisión o fiscalización anual deberá ser efectuada por auditores competentes, designados por la Junta Directiva.

Los auditores revisarán los registros financieros de la Tesorería y demás aspectos contables del Centro, tan seguido como sea requerido por la Junta, además de auditar las cuentas anuales.

La persona o firma especializada que se ocupe de la auditoría, deberá reunir los requisitos señalados por las Leyes peruanas para los auditores de sociedades privadas y públicas.

CHAPTER FOUR

Fiscalization and Liquidation

Art. 15.- An annual fiscal review will be made by competent auditors named by the Board of Trustees.

The auditors shall review the financial records of the Treasury and other accountant aspects of the Center, as frequently as indicated by the Board, as well as auditing annual accountings.

The person or specialized accounting firm shall meet the requirements indicated by Peruvian laws for auditors of private, anonymous societies.

Art. 16° .- El Centro puede disolverse y sus fondos liquidados por decisión de dos tercios (2/3) de los miembros de la Junta. El Director General, al momento de ser disuelto del Centro, será responsable de los fondos del mismo y continuará actuando bajo la dirección de la Junta. Al momento de liquidación de los fondos del Centro y después de que todas las deudas hayan sido canceladas, cualquier fondo sobrante así como los bienes serán transferidos al Ministerio de Agricultura, en forma considerada la más conveniente por el liquidador y el Ministerio de Agricultura.

Art. 17° .- El Centro inició sus actividades en el Perú el 20 de enero de 1971.

Art. 18° .- El patrimonio del Centro estará constituido por todas las donaciones que reciba.

Art. 19° .- El representante del Centro es su Director General.

Art. 16.- The Center may be dissolved and its funds liquidated by the decision of 2/3 of all the members of the Board of Trustees. The Director General of the Center at the time of termination shall be responsible for the Center's funds and shall continue acting under the direction of the Board. Upon liquidation of the Center's funds and after all debts have been paid, any remaining funds as well as property will be transferred to the Ministry of Agriculture in the most appropriate manner considered by the liquidator and the Minister of Agriculture.

Art. 17.- The Center initiated its activities in Peru on January 20, 1971.

Art. 18.- The patrimony of the Center will be composed of all donations received.

Art. 19.- The representative of the Center is its Director General.

