ACENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY

Batch #24

1. SUBJECT CLASSIFICATION

A. PRIMARY: Agriculture — AE70-0000-G512

B. SECONDARY: Distribution and marketing--Bolivia

2. TITLE AND SUBTITLE
Study of grain storage and marketing in Bolivia

3. AUTHOR(S)
Pfost,H.B.; Niernberger,F.F.

4. DOCUMENT DATE: 1973

5. NUMBER OF PAGES: 113p.

6. ARC NUMBER: ARC BL631.23.P531

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Kan.State

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*
(In Food grain drying,storage,handling,and transportation rpt.no.42)

9. ABSTRACT

10. CONTROL NUMBER
PN-RAB-431

11. PRICE OF DOCUMENT

12. DESCRIPTORS
Bolivia
Grain crops
Storage

13. PROJECT NUMBER

14. CONTRACT NUMBER
CSD-1588 GTS

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

STUDY OF
GRAIN STORAGE AND MARKETING
IN BOLIVIA

Prepared by
Dr. Harry B. Pfost
Food and Feed Grain Institute
Kansas State University

and

Dr. Floyd F. Niernberger
Consultant

Prepared for the
AGENCY FOR INTERNATIONAL DEVELOPMENT
AID/csd-1588
Technical Assistance in
Food Grain Drying, Storage, Handling and Transportation
at the
FOOD AND FEED GRAIN INSTITUTE
KANSAS STATE UNIVERSITY
MANHATTAN, KANSAS 66506

Dr. William J. Hoover, Director
Dr. Leonard W. Schruben, Associate Director
Dr. Richard Phillips, Agricultural Economist
Dr. Harry B. Pfost, Agricultural Engineer
Dr. Do Sup Chung, Agricultural Engineer
John R. Pedersen, Entomologist

SUMMARY OF REPORT/PUBLICATION

Title of Report/Publication: Study of Grain Storage and Marketing in Bolivia

Authors: Dr. Harry B. Pfost and Dr. Floyd F. Niernberger

Period of Report/Publication: April 20 - 30, 1973 ---- September 10 - 27, 1973

Project Title: Technical Assistance in Food Grain Drying, Storage, Handling, and Transportation

Contract Number: AID/csd-1588

Contractor: Food and Feed Grain Institute, Kansas State University, Manhattan, Kansas

Principal Investigators: Dr. Harry B. Pfost and Dr. Floyd F. Niernberger

SUMMARY STATEMENT

The first trip of this study was made to consult with AID/Bolivia and GOB officials regarding problems of grain (wheat) storage in the subtropical area near Santa Cruz. It was found that long term storage would be difficult because of high humidity and insect infestation.

The trip occurred at the time when new support prices for wheat were being set. The author consulted with Mr. Robert Moffett, ROD, daily during a period of several days.

The second trip reported involved one agricultural economist and one agricultural engineer. This trip study was requested to guide AID and GOB officials in their consideration of problems related to grain storage and marketing.

It is impossible now to give specific recommendations for an overall grain storage and marketing program for Bolivia. Data regarding production and consumption by provinces (or smaller geographic areas) does not exist. Until this data is available it would not be possible to locate and size facilities and systems required.

In addition to grain production and consumption data, much information regarding credit, transporation costs (particularily farm to market) marketing time patterns, etc. is needed. Present plans for executing five of six small buying stations for wheat will provide much needed information, if carried out.

The problem of possible illegal exports of food grain and grain products was studied and recommendations were made.

TABLE OF CONTENTS

Table of Contents i

List of Tables ii

Introduction 1

PART I

Study of Some Wheat Storage and Marketing Problems in Bolivia 5

Grain Storage 5

Recommendations for Grain Storage in the Santa Cruz Area . 6

Grain Storage Costs 8

Physical Requirements for an Emergency Wheat Purchase Program . 14

Wheat Pricing Program 17

PART II

Recommendations for a Coordinated Grain Marketing System in Bolivia

Existing Patterns of Grain Production, Distribution and Utilization 25

Grain Production 25

Grain Distribution 33

Grain Utilization 36

Storage Facilities 40

Processing Facilities 41

Marketing 43

Wheat 43

Corn 49

Barley 52

Rice 54

Summary 59

Other Grains 60

Grain Grading 61

Wheat Grades 63

Barley 63

Corn, dent 64

Corn, sweet or non-dent 66

Rice 66

Other Grains 66

Recommendations 66

Credit 69

1980 Projections 71

Demand 71

Production 73

Grain Distribution 79

Necessity for Considering Agricultural Price Adjustments in Bolivia 81

Recommendations 85

References 89

Appendix 91

Proposal for the Installation of Assembly Centers and the Marketing of the National Wheat Production 93

LIST OF TABLES

PART I

Table A - Costs for 5,000 M.T. Storages 11
Table B - Costs for 1,000 M.T. Storages 12
Table C - Costs: Hundredweight of Product 19
Table D - Milling Cost Comparisons 21
Table E - Wheat Subsidies Required at Various Prices to Yield Flour at $b. 126.50/qq 22

PART II

Table 1 - Production, Harvested Hectares, and Yield of Wheat .. 27
Table 2 - Production, Harvested Hectares, and Yields of Corn .. 29
Table 3 - Production, Harvested Hectares, and Yield of Rough Rice 32
Table 4 - Estimated Supply and Utilization of Wheat, Corn, Barley, Rice and Soya 37
Table 5 - Bolivian Flour Milling Capacity & Location 41
Table 6 - Typical Truck Freight Costs for Wheat 45
Table 7 - Grades and Crade Requirements for Corn 67
Table 8 - Projected Population 71
Table 9 - Population Projection of Bolivia by Departments (States), Capitals and Provinces 72
Table 10 - Projected Consumption of Wheat and Rice 73
Table 11 - Projection of Wheat Production, Planted Area and Yield by Department in Bolivia 74
Table 12 - Projection of Corn (grain) Production, Planted Area, and Yield by Departments in Bolivia 75
Table 13 - Projection of Soybean Production, Planted Area and Yield by Departments in Bolivia 76
Table 14 - Projection of Barley (grain) and Rice (rough) Production Planted Area, and Yield in Bolivia 77
Table 15 - Potential Cultivated Area and Area under Cultivation in the Departments Considered for Wheat, Corn, Barley, Rice, and Soybeans Production 78
Table 16 - Price of Grain Moving From U.S. Gulf Ports Toward La Paz 82

Table 17 - Domestic Prices Required to Reflect World Market Prices and Reduce Dangers of Local Grain Exports .. 83

APPENDIX

Department of Chuquisaca 97
Department of Potosi 98
Department of Cochabamba 99
Department of Cochabamba 100
Department of Cochabamba 101

Index 1 - Budgeted Construction Costs of a Storage Facility 102
Index 2 - Detailed Information About Equipment and Materials ... 103
Index 3 - Salaries, Wages, and Per Diem 104

Details of Income, Expenses and Profits Per Center 105
Buying Centers: Volume, Capacity, Investment and Operating Capital 106

Table A-1 - Production Harvested Hectares and Yield of Wheat, Corn, Barley, Rice and Soybeans in Bolivia 107

INTRODUCTION

This report has been prepared at the request of USAID to cover observations and recommendations made during two visits to Bolivia in 1973. The first visit was made during the period April 20 to May 1 by Dr. Harry Pfost and the second during the period September 11 to Sept. 27 by Dr. Floyd Niernberger and Dr. Pfost.

The authors acknowledge the assistance of the many members of the following organizations who gave generously of this time to assist the authors in their work: USAID/Bolivia/RDD, Utah State University team, Bolivian Ministry of Agriculture (particularly members of the National Wheat Institute and Planning Division), the National Rice Marketing Company and industry representatives of the flour milling, brewing and other grain processing industries.

The first visit in April was concerned with an immediate problem of wheat storage in the subtropical, Santa Cruz area and problems associated with setting new support prices for wheat.

The second visit in September was in response to a request to make an overall study of the grain marketing system. The same team had made a study of the Bolivian grain marketing system in May 1971 and this study was reported in "Observations and Recommendations for Improving Grain Storage and Marketing in Bolivia" Report No. 22, May 1971, Food and Feed Grain Institute, Kansas State University, Manhattan, Kansas.

The basic recommendations of this report were reviewed with USAID/ Bolivia, Bolivian Ministry of Agriculture and other interested parties

before the team left Bolivia. It is hoped that the recommendations of this report will aid the Government of Bolivia in improving the marketing of grain, assuring a more stable food supply and increasing the income of the nation.

PART I

STUDY OF SOME WHEAT STORAGE AND MARKETING PROBLEMS IN BOLIVIA

April 20 through April 30, 1973

Prepared by
Dr. Harry B. Pfost
FOOD AND FEED GRAIN INSTITUTE
KANSAS STATE UNIVERSITY

In response to a request
for technical assistance
USAID/Bolivia

STUDY OF SOME WHEAT STORAGE AND MARKETING PROBLEMS IN BOLIVIA

Two major subject areas were studied. The first problem was concerned with problems of storage of wheat in the Santa Cruz area. Plans were being made to encourage the planting of several thousands of hectares of wheat following cotton harvest. Since little wheat has been produced in this area and since it is a subtropical climate, questions regarding storage had arisen.

The other problem which arose was related to the establishment of a support price. This problem was timely because farmers being urged to plant wheat in the Santa Cruz area needed to know what the price would be. The existing wheat support price, as of April 15, 1973, was based upon world market prices as of about July 1, 1972. The rise in wheat prices from July 1972 to April 1973 had been rapid and Bolivian farmers had not benefited from this increase.

GRAIN STORAGE

The author and Robert Moffett (USAID/RDD) made a trip to Santa Cruz to study some of the storage problems including availability of storage. The only bulk storage in the area was located at a new flour mill which was under construction. The storage was limited and could handle only a small part of the anticipated production. Some warehouse storage for bagged grain was available at rice mills, but was limited if rice did not move out fast enough.

A sample of wheat in bags at the flour mill indicated a moisture content of 15-16% which is too high for long term storage. Relative humidity data which had been obtained during the 1971 study indicated average relative humidities in this area of about 71 - 75% which would result in wheat of about 14% moisture. This led to questions of the data previously published: Hargreaves, G. H. Requirements for Irrigation of Sugar Cane: Santa Cruz, Bolivia. Mimeograph copy, AID/USU, Contract No. LA-319. It was finally determined that this data was average daytime humidities, although the author did not so state. Average humidity data does not exist to the authors' knowledge. A probable average humidity of nearer 85% would be likely. This would lead to an equilibrium moisture of approximately 17% in wheat and a very limited storage period before mold developed.

Wheat stored in steel bulk bins at a moisture content below 14% would probably have a better storage life, but would have to be inspected frequently.

The following recommendations were prepared for immediate use before leaving La Paz:

Recommendations for Grain Storage in the Santa Cruz Area

A major increase in wheat production in the Santa Cruz area in 1973 will raise some problems not frequently faced before in Bolivia for wheat.

The first of these problems will be that of insect control. It was reported that wheat arriving from the field at harvest exhibits signs of insect infestation. This grain must be treated as soon as possible to prevent further insect damage.

One method of treating this grain would involve the following steps:

1. Pile the bags on wood pallets which will keep the grain about 15 cm off the concrete floor. The piles might conveniently be about 5 to 6 m. square and 3 to 4 m. high.

2. Cover the piles with plastic film to prevent escape of the fumigant. Joints should be taped and the edges of the plastic should be weighted and held firmly to the floor.

3. Using care not to damage the film, apply the fumigant to the top of the pile through the plastic and close the openings.

4. Follow directions for the particular fumigant used regarding amounts and fumigation time.

Moisture conditions in the Santa Cruz area will not be favorable for long term (over 3 months) grain storage. Wheat arriving from the combine may exceed the 13% moisture which is normally recommended for safe storage. Sun drying should be adequate and it would probably be safest to bring the grain on down to 10-12% moisture.

Because of the high relative humidity conditions the dried grain will tend to rewet, probably to 15-16%. Two remedies to the rewetting may be worth investigating.

1. Remove the grain to the Cochabamba area as quickly as possible after it is fumigated.

2. Leave the plastic fumigation covers over the piles to determine if this vapor seal will prevent excessive moisture migration. The grain should be inspected frequently to see if the moisture is exceeding some fairly safe level--say 14%.

3. Mill the wheat produced and stored at Santa Cruz as soon as possible. One or two piles might be retained to determine the effectiveness of the plastic film in preventing moisture migration.

Certain steps need to be taken immediately:

1. Determine if Phostoxin or other fumigants are available. If not then it should be ordered.

2. Wide sheets of polyethylene or other film do not appear to be available. Order film and sealing tape.

3. Locate warehouses which will be available at the time of wheat harvest.

4. Prepare, or locate, wood pallets.

5. Assign and train personnel to follow this storage which will be critical to the future success of the wheat production program in Santa Cruz.

Grain Storage Costs

The cost of storing grain in bags has not been studied and reported as well as the costs of storing grain in bulk. This analysis will attempt to arrive at a reasonable estimate of storage rates for bagged grain in two different sizes of structures and under two different operating conditions for each size.

<u>The sizes and conditions are</u>:

I. A 5000 MT storage operated in conjunction with an existing flour mill.

II. A 5000 MT storage operated as a separate business.

III. A 1000 MT storage operated as a grain collection station.

IV. A 1000 MT storage operated as a part of an overall agricultural supply center.

The following assumptions are made regarding basic cost factors:

1. Buildings costs will be $40/m^2$
2. Land costs will be ¼ of building cost
3. Building will be depreciated over 20 years
4. Interest rate is 10%
5. Insurance will be 2% of building plus ½ of contents annually
6. Maintenance will be 1% of building cost annually
7. Quality maintenance costs will be 1% of product value
8. Product value will be $150/MT
9. Manager's salary will be $100/month
10. Labor is assumed at $.10/hr.

Structures

The basic structure will consist of a concrete floor about 15 cm. thick. Walls will be of concrete block, galvanized metal or whatever is cheapest locally. Roof will be of galvanized metal or cheapest alternative. Large doors should be provided to allow trucks to enter the building for unloading or loading in the larger structures or side doors should be provided for loading. The smaller structures may be constructed of adobe if the reduced height is compensated for by lower material costs.

It is assumed that the side wall height is 5 m. with an effective working height of 3.5 m. Seventy percent of the total floor is or can be used for storage - the remainder is for aisles, etc.

It is assumed that for bagged grain .74 MT can be stored in 1 cu.m. The structure sizes then become

$$\frac{5000}{.750 \times 3.5} = 1900 \text{ sq. m.} \qquad 2000 \text{ sq. m.}$$

$$\frac{1000}{.750 \times 2.5} = 380 \text{ sq. m.} \qquad 400 \text{ sq. m.}$$

Processing and handling

Cleaning and drying costs will not be included because these items should have their own margins.

Handling in and out of storage will be itemized separately on the basis that 2 minutes will be required to unload or load a bag and that the labor will only effectively work 50% of the day.

Bags

No costs for bags are included here because in previous wheat cost studies the cost of the bag has been included as a cost of wheat production.

Other Factors

For the operation of a grain storage in conjunction with a flour mill it is assumed that a full time manager will not be required - 6 months of a salaried employee is allotted. Also for the flour mill, no unloading cost is included because incoming grain unloading cost should be allocated to the mill production cost.

For the general agricultural services center only 3/4 of the managers salary and building and land costs are allocated to the grain storage function.

Tables A and B show the estimated costs for storing grain in Bolivia under the assumption given above.

TABLE A. Costs for 5,000 M.T. Storages

Investment	Independent	With Mill
Building Costs	$US 80,000	$US 80,000
Land	20,000	20,000
Other equipment, scales, etc.	15,000	15,000
Total	$US115,000	$US115,000

Annual Costs		
Building depreciation, 20 yrs.	$US 4,000	$US 4,000
Equipment depreciation, 10 yrs.	1,500	1,500
Interest on ½ of bldg. and equipment	4,750	4,750
Interest on Land	2,000	2,000
Insurance on ½ of bldg. and equipment	950	950
Insurance on ½ of contents	7,500	7,500
Maintenance of building and equipment	950	950
Quality and quantity maintenance	7,500	7,500
Managers salary	1,200	600
Loading of storage (1.34 hr/M.T.)	670	670
Unloading of storage (1.34hr/M.T.)	670	---
Total Annual	$US 31,190	$US 30,420
Total $US/M.T.	6.32	6.10

TABLE B. Costs for 1,000 M.T. Storages

Investment	Independent	Agric. Supply
Building	$US 16,000	$US 16,000
Land	4,000	4,000
Equipment, Scales, etc.	2,000	2,000
Total	$US 22,000	$US 22,000

Annual Costs		
Building depreciation, 20 yrs.	$US 800	$US 600
Equipment depreciation, 10 yrs.	200	200
Interest on ½ of bldg. and equip.	900	670
Interest on land	400	300
Insurance on ½ of bldg. and equip.	180	140
Insurance on ½ of contents	1,500	1,500
Maintenance of bldg. and equip.	180	140
Quality and quantity maintenance	1,500	1,500
Managers salary	1,200	900
Loading of storage	140	140
Unloading of storage	140	140
Total Annual	$US 7,140	$US 6,230
Total $US/M.T.	$US 7.14	$US 6.23

Storage charges in the U.S. are now being calculated at about $ .12/Bu./yr. for storage plus .05/Bu. handling in and out. This amounts to $6.20/MT. It would appear that the above calculations for Bolivia conditions are a reasonable approximation.

A recent study has been prepared on the estimated cost of rice storage in Indonesia* which may be of interest because of the similarity of wage rates, etc., between Bolivia and Indonesia. In the Indonesian study the estimated investment cost is $17,611 for 1000 ton storages and $60,658 for 5000 ton storages. A part of the difference between the estimates which I have prepared and the Indonesian estimate is explained by a lower land cost assumed for Indonesia and I have included a truck scale for the 5000 ton warehouse.

The Indonesia estimate shows a total cost per ton of $8.10 for the 1000 ton storages and $2.50 for the 5000 ton storage if one annual turnover is assumed. However the study assumed an average holding period of 1.5 months which drastically reduced the interest costs on inventory and labor cost per turnover. The payroll costs for the 5000 ton warehouse may be low since they are shown as the same for the 1000 ton warehouse.

In conclusion, it would appear that storage margins of about six to eight dollars per ton should be reasonable. In other words, the price of wheat following harvest should increase by $.50 to $ .65/ton/month if storage margins are going to stimulate investment in storage.

---

*Economic and Engineering Study. Rice Storage, Handling and Marketing, The Republic of Indonesia. USAID, Prepared by Weitz, Hettelsater Engineers, 1972.

PHYSICAL REQUIREMENTS FOR AN EMERGENCY WHEAT PURCHASE PROGRAM

USAID/Bolivia requested assistance in estimating the cost of instituting an emergency wheat purchase program. The costs would be applicable to both the Santa Cruz and traditional areas.

No feasibility study was attempted to determine where buying stations or storage should be located.

The operating and investment costs for larger storages were estimated in the last section. The small assembly - purchase centers could probably be used.

Storage of grain in the traditional area is relatively simple as far as quality maintenance is concerned. The grain is dry at harvest and the low relative humidity should prevent moisture migration into the grain reducing the dangers of mold. Insect infestation is very slight. Rodents are practically nonexistent.

For an emergency program of short duration the operating costs of the system may be high but the investment costs, other than capital required for the wheat purchase, should be relatively low.

This analysis is based upon the establishment of about 30 buying stations and three large storages of approximately 5000 M.T. capacity each. This should provide sufficient storage for the amount of grain which has been or probably would be marketed in commercial channels in the first year. Marketing seems to have traditionally been scattered throughout the year. If this pattern continues the main storages should turn over more than once per year. This distribution of marketing might be encouraged by offering a higher price for grain each succeeding month

during the period between harvests.

Costs of the program might be reduced by using present agricultural extension personnel to man the collection stations. These men would need some training on grain grading and handling procedures. An excellent source of instruction for a two or three day course would be IICA in Bogota, Colombia. IICA has trained grain graders for Colombia.

If 30 stations purchase 15,000 tons then some stations might purchase as much a 1000 tons/yr. A reasonable estimate of the maximum purchases per day might be 20 tons. On this basis, four trucks should be provided for the busiest buying stations during the period of most intense marketing. On this basis about 100-150 trucks should be located and assigned on the basis of needs as they arise. The number of trucks could be reduced drastically after the original buying rush.

A storage structure at the buying station probably should have a capacity of 40 tons. If these storages can be used to a height of 2 meters then about 40 quad meters of floor space will be required.

A station purchasing 20 tons of grain per day will handle about 400 sacks of grain most of which will probably have to be resacked. Five minutes should be a reasonable time to weigh, resack and pile one sack of grain. Perhaps four laborers should be budgeted at the busier stations during the rush season.

Equipment required at the buying station would include:

150 Kg. platform scale
500 Kg. platform scale
One set of four testing sieves
One 500 g. capacity beam scale
Sewing needles and cord
A device for pouring grain from one sack to another
One table for test equipment, writing, etc.

If 15,000 tons of grain is in storage at one time then 300,000 bags will have to be provided. It is doubtful if more than 150,000 to 200,000 will be required at any one time.

The grain should be weighed and graded when received and if the farmer wishes to retain his sacks it should be resacked into 46 Kg. bags. Maintaining a uniform bag weight will reduce the time required later in accounting for grain transfers.

The terminal storages will probably be larger buildings and if grain can be piled to a depth of 3.5 meters then about 2000 quad meters of floor space will be required. To prevent possibility of moisture migration through the floor it would be best to provide wooden pallets under the piles. Openings should be sealed against the possible entry of birds and rodents.

Any grain coming from the Santa Cruz area should be piled separately and fumigated immediately. Plastic sheeting and fumigant should be ordered immediately for air shipment.

Since these terminals may receive directly from farms, they will need the same receiving and grading equipment as the receiving points. Consideration should be given to paying a modest premium for grain delivered here since it will reduce both handling and transport costs. (Now is a good time to institute the idea of margins.)

Storage costs for a system of this type will be higher than costs for a system previously calculated. These costs were estimated to be about $8/T yr. based upon once per year turnover. If this storage margin could be instituted now it would amount to about $b 0.60 / month/qq. Thus, if an average price to the farmer of $b. 100/qq is desired this might start at $b. 96.40/qq at harvest and increase by $b. 0,60/month until it reached $b. 103,60/qq.

The problem of establishing accurate grain grading standards is not proposed. One possible great abuse that might arise is that the grain would be watered before delivery. Moisture tests might be desirable but will increase equipment costs by about $12,000. The procedure for making moisture tests is not difficult. Probably it would be best just to refuse grain over 13%. Liter weight tests have been used in the country, but it is doubtful if this test is of great economic importance.

WHEAT PRICING PROGRAM

The GOB wished to encourage the planting of wheat in the Santa Cruz area. In order to encourage the production of wheat, it was decided that wheat prices to farmers in Bolivia should reflect world market prices. The decision was also made to maintain the price of flour, and bread, which required that a subsidy be paid through the flour mills to the producer (or person delivering wheat to the mill).

Milling Costs

The costs for milling as shown on pp. 50-51 of "Estudio del Trigo"* are reviewed and compared with some of the U.S. Cost estimates for milling.

In order to make this comparison it is necessary to revise some of the cost figures shown on pp. 51.

Items to be deleted include:

Cost of wheat

Cost of bags (most U.S. flour is now sold in bulk).

Deducting these two items leaves a net processing cost of

$b. 61.3218 - (48.000 + 3.0238) = 10.2980

---

* Ministerio de Asuatos Compesinos y Agricultura, 1972.

Using the old exchange value of $b.12 = $US 1 this production cost is

$$\frac{10.2980}{12} = \$US.87/qq \text{ of wheat milled}$$

Using US milling costs as reported by the National Commission on Food Marketing* as shown in Table C and calculating the milling costs for the 400-2499 hundred weight daily capacity yields:

$US..7173 total cost for 100 lbs. of wheat milled

$$\text{or } \frac{.7173}{100} \times 2.2 \times 46 = .725 \ \$US/qq$$

If the extraction is 72% and if all milling costs are allocated to flour (none to by-products) then the actual milling cost for flour would be

$$\frac{.725}{.72} = \$US\ 1.01/qq$$

Using costs reported in the USDA publication, "The Wheat Situation"** show a U.S. miller's flour spread of $US .0094/lb. or

$$.0094 \times 2.2 \times 46 = \$US\ \ .95/qq \text{ of flour.}$$

This value is probably lower than the value obtained for the smaller mills because of the averaging effect of the larger and more efficient mills.

Overall it would appear that the estimated milling costs for Bolivia were reasonable when prepared before the devaluation.

Some possible cost differences between US and Bolivian costs include:

- Equipment costs are probably lower in the US than Bolivia although most major milling equipment is imported from

---

*National Commission on Food Marketing (1966), Organization and competition in the milling and baking industries. Tech. study No. 5, US Government Printing Office, Washington, D.C. 167 pp.

**"The Wheat Situation"

TABLE C. Costs Hundredweight of Product (Flour plus by-products) Sold
1964-1965 Marketing Year
(Based on reports from 78 plants milling hard wheat)

Hundredweight Daily Capacity	Manufacturing Costs	Administrative Costs	Selling Costs	Total Costs
12,500 and over	0.3746	0.1098	0.0927	0.5771
10,000 - 12,499	.3574	.0801	.0471	.4846
7,500 - 9,999	.3042	.0856	.1037	.4935
5,000 - 7,499	.3009	.0909	.0704	.4622
2,500 - 4,999	.3385	.1402	.0972	.5739
400 - 2,499	.4214	.1338	.1621	.7173
Average	.3366	.1019	.0845	.5230

Europe in both cases. •Labor is cheaper in Bolivia but more is required because of the larger amount of flour handled in bags.

•Electrical energy is probably cheaper in the US.

•Maintenance and repairs are probably about the same in both countries.

•Cheaper labor is probably balanced by higher material costs.

Table D shows some comparisons of milling costs based upon the three studies. This table was prepared to place the cost of bags back in the overall costs and to allow for some inflation of Bolivia milling costs since devaluation.

Wheat Subsidies

If a national policy of fixed flour and bread prices is to be maintained at the existing levels and considering the present levels of world wheat prices then subsidies will be required.

This analysis is an attempt to determine the amount of subsidy which would be required under certain conditions of world wheat prices to maintain the established flour price. The first four columns of Table E show the amount of subsidy which will probably be required under various conditions of Gulf port prices.

The last three columns of the Table show how, if various degrees of subsidy are paid the farmers, return per ton of wheat will be influenced.

TABLE D

MILLING COST COMPARISONS (COST/MT MILLED)

	$US/T	$b/T
Estudio del trigo, 72% Extr. (12 $b/1 $US)	24.50	294
Estudio del trigo, 72% Extr. (20 $b/1 $US)	14.70	294
Estudio del trigo+40% (20:1)	20.50	410
Estudio del trigo+60% (20:1)	23.50	470
US 1964-1965 (plus bag)	25.40	508
US 1972 (plus bag)	24.80	497

TABLE E. WHEAT SUBSIDIES REQUIRED AT VARIOUS PRICES TO YIELD FLOUR AT $b. 126.50/qq

FOB Gulf $US/MT (80% Extraction)	64 (1)	76	80	90				
Bolivian Farmer $US/MT (72% Extraction)						111 ($b. 100/qq)	121 ($b. 110/qq)	92 ($b. 83/qq)
Transport, Ins., Etc. $US/MT	29 (1)	34	34	34				
Grain at Mill $US/MT	93	104	114	124		110	120	92
Subsidy $US/MT		8	18	28		18	28	0
Grain cost to mill $/MT	93	96	96	96		92	92	92
Milling Cost $US/MT	18 (1)	23	23	23		23	23	23
Less by-products $US/MT	6 (2)	10 (3)	10 (3)	10 (3)		15 (4)	15 (4)	15 (4)
Net cost	105 (5)	109 (5)	109 (5)	109 (5)		100 (6)	100 (6)	100 (6)
Cost flour $US/qq	6	6.30	6.30	6.30		6.30	6.30	6.30
Cost flour $b/qq	120	126.50	126.50	126.50		126.50	126.50	126.50

(1) Estimated May 1972
(2) Estimate from "Estudio del Trigo"
(3) 4.3qq at $b 25/qq
(4) 6.2qq at $b 25/qq
(5) Net cost of 17.5qq of flour
(6) Net cost of 15.8qq of flour

PART II

RECOMMENDATIONS FOR A COORDINATED GRAIN MARKETING SYSTEM IN BOLIVIA

by

Floyd F. Niernberger and Harry B. Pfost

Food and Feed Grain Institute
Kansas State University
Contract AID/csd-1588

September 10 through September 27, 1973

RECOMMENDATIONS FOR A
COORDINATED GRAIN MARKETING SYSTEM

In Bolivia

EXISTING PATTERNS OF GRAIN PRODUCTION, DISTRIBUTION AND UTILIZATION

Data on production and distribution of agricultural products has been greatly improved since 1971. For corn and rice, better information is contributing to analysis of programs for these two grains. Surveys have been conducted in certain years for the other grains and oilseeds, but it will be several more years before a historical production base will be sufficiently developed to prepare meaningful projections of production and distribution movements by Departments.

Bolivia has not conducted an agricultural census since 1950. The production data shown in Appendix Table A-1 generally has been estimated from the 1950 data except for some grains for certain years which are shown in Tables 1-3.

The USAID/Utah State Team in conjunction with the Ministry of Agriculture has undertaken a benchmark agricultural sector study to analyze the overall position of cereal and oilseed crops in Bolivian agriculture. However, it will be a number of months before the survey results are tabulated and analyzed.

The following discussion on the various grains can only be carried out with knowledge of these limitations on data information prepared by Government Agencies and knowledgeable individuals.

GRAIN PRODUCTION

WHEAT: The reported annual production, harvested hectares, and yield of wheat for crop years 1962-72 is shown in Appendix Table A-1. Over the ten-year period, total production showed an increase, however a special survey in 1971-72 reduced the

previous production estimates considerably; to about 90 percent of production at the start of the period. Hectares harvested were also considerably reduced but yield was greater than previously estimated. In the 1971-72 survey, Department estimates were made, see Table 1. Estimates shown in Table 1 were slightly less than official totals in Table A-1. Of the Departments surveyed, Cochabamba yields were greatest.

Efforts have been made by USAID to provide information and means for improved seeds, better cultural practices, and use of fertilizer to farmers in the traditional wheat growing regions of Bolivia during the past three years. Efforts this past planting season were also made in the Santa Cruz Department to increase wheat planting in rotation with cotton. Harvest has begun in the Santa Cruz area but early reports on the success of the program are mixed.

A wheat price support program for farmers to provide incentive for increased wheat plantings and use of yield increase measures was undertaken in 1973. The effects of the program on increased wheat production are not known at this time, but reported payments to farmers for harvested grain appear to be reflecting the support payment level. By Government Decree, official purchase and sale prices for types of wheat are fixed, with several premium and discount categories of quality measures enforced. The Decree was probably not announced early enough to greatly influence plantings in the traditional area, but should affect decisions on next year's plantings.

TABLE 1. PRODUCTION, HARVESTED HECTARES, AND YIELD OF WHEAT

BY DEPARTMENTS IN BOLIVIA, 1971-72

YEAR		Chuquisaca	Cochabamba	Potosi	Tarija	Country Total 1/
1971-72	Production (1000 M.T.)	14.5	19.5	7.6	4.4	46.0
	Harvested Has. (1000 Has.)	20.2	17.6	12.6	6.0	56.4
	Yield (M.T./Ha.)	0.7	1.1	0.6	0.7	0.8

1/ Total does not agree with official total for year due to survey differencies.

MINISTERIO DE AGRICULTURA Y GANADERIA, DIVISION DE ESTADISTICAS, La Paz, Bolivia, Hector Nogales, September 20, 1973.

CORN: The reported annual production, harvested hectares, and yield of corn for crop years 1962-72 is shown in Appendix Table A-1. Over the ten-year period, total production appeared relatively stable considering weather influences. Since survey data was not available for this category of corn, the data is the best yearly estimate from 1950 data.

Department estimates on hard corn production are available for the crop years 1970-73, Table 2. Although these estimates are concerned basically with corn entering market channels or so-called "Cuban" corn, they point out the shift from corn production in the Santa Cruz area to other Departments, even though yields in the Santa Cruz area were nearly as good. The reduction in corn production in Santa Cruz is due to better prices for competing crops, such as cotton and sugar cane. An adverse effect has been recent shortages of corn for animal use in the Department.

Estimates of corn production are confounded by the numerous classes and types of corn being incorporated into the corn (grain) category. Although, sweet corn is reported separately, the corn data shown in Appendix Table A-1, includes types of dry corn used for food including: hominy, ground corn, and corn used for "Chicha". The food uses of this corn category are larger than first thought two years ago, and probably will continue to require special corn varieties. Efforts to increase corn production through improved varieties and fertilizer will likely not have a substantial effect on this category of corn, used for domestic food. Perhaps cooperation with animal feed

TABLE 2. PRODUCTION, HARVESTED HECTARES, AND YIELDS OF CORN (HARD)

BY DEPARTMENTS IN BOLIVIA, 1970-1973

YEAR		Chuquisaca	Santa Cruz	Tarija	Rest of Country	Country Total
1970-71	Production (1000 M.T.)	42.4	92.6	21.6	35.5	192.1
	Harvested Has. (1000 Has.)	20.2	51.0	14.4	33.3	118.9
	Yield (M.T./Ha.)	2.1	1.8	1.5	1.1	1.6
1971-72	"	43.5	69.5	21.7	36.5	171.2
	"	28.5	40.0	14.5	26.0	109.0
	"	1.5	1.7	1.5	1.4	1.6
1972-73	"	54.2	70.0	27.5	42.0	193.7
	"	25.6	35.0	13.0	26.0	99.6
	"	2.1	2.0	2.1	1.6	1.9
Average	"	46.7	77.4	23.6	38.0	185.7
	"	24.8	42.0	14.0	28.4	109.2
	"	1.9	1.8	1.7	1.3	1.7
Percent of Total	Production (1000 M.T.)	25.2	41.7	12.7	20.4	100.0
	Harvested Has. (1000 Has.)	22.7	38.5	12.8	26.0	100.0

MINISTERIO DE AGRICULTURA Y GANADERIA, DIVISION DE ESTADISTICAS, La Paz, Bolivia, Hector Nogales, September 20, 1973

users through contracts, would provide incentive for increasing corn yields and overall production.

BARLEY: Barley for grain uses are reported separate from barley used for hay. The reported annual production, harvested hectares, and yield of barley for crop year 1962-72 is shown in Appendix Table A-1. Over the ten-year period, production showed a 26 percent increase. Yields did not exhibit any increase over the period. A survey was taken in crop year 1968-1969 to check on the information projected from the 1950 census. Department estimates on barley production are not available.

One unresolved production question was the shortage of barley for brewing purposes. Breweries demanded an estimated 10,000 metric tons of barley in 1972, and indicated they have been unable to purchase sufficient quantities for their needs the past 3 years. Brewers claimed to purchase all barley offered by farmers. Because 70,000 metric tons were supposely produced, a puzzle exists, unless quality factors are involved or price relationships do not bring barley into cash markets. Seed usage reported by MAG[1] would indicate the harvested hectares shown in Table A-1 were planted to barley.

RICE: The reported annual production, harvested hectares, and yield of milled rice is shown in Appendix Table A-1. Over the ten-year period, production increased nearly 75 percent by 1967-70, and then declined to about a 60 percent overall increase by 1972. Yields did not exhibit a general increase, so

---

1 MAG-Ministry of Agriculture.

the production grains were due basically to greater hectarage harvested.

Department data for rough rice production, harvested area, and yield are shown in Table 3. From an estimated 100 percent of rice production in Bolivia in 1967, Santa Cruz Department has decreased to nearly 89 percent in 1973. Competing cash crops of cotton and sugar cane are felt to be partly responsible for the decrease; as well as, relatively low prices for rice to the farmer in 1970 and 1971 due to a market surplus. Because of the shift from Santa Cruz and lower yield of rice per hectare in the other Departments, relatively more hectares are used in producing rice now than in the late sixties. Santa Cruz is down to about 68 percent of total harvested rice hectares in 1973, compared to the ten-year average of 86 percent.

SOYBEANS: The reported total annual production, harvested hectares, and yield of soybeans is shown in Appendix Table A-1. Growth has been moderate over the six-year period. However, industry figures for 1972 reported 1,900 metric tons of soybeans were grown; somewhat higher than the 1,600 reported by MAG.

Department estimates of soybean production are not available, although most is grown in the Santa Cruz area. Recent indications are that a soybean-wheat rotation would be preferred over the cotton-wheat rotation experiments in Santa Cruz, potentially leading to greatly increased soybean plantings in the future.

TABLE 3. PRODUCTION, HARVESTED HECTARES, AND YIELD OF ROUGH RICE BY DEPARTMENTS IN BOLIVIA, 1964-1972

YEAR		Cochabamba	La Paz	Santa Cruz	Country Total
1964-65	Production (1000 M.T.)	-.-	-.-	51.3	51.3
	Harvested Has. (1000 Has.)	-.-	-.-	32.8	32.8
	Yield (M.T./Ha.)	-.-	-.-	1.6	1.6
1965-66	"	-.-	-.-	51.7	51.7
	"	-.-	-.-	33.5	33.5
	"	-.-	-.-	1.5	1.5
1966-67	"	-.-	-.-	56.7	56.7
	"	-.-	-.-	30.1	30.1
	"	-.-	-.-	1.9	1.9
1967-68	"	0.7	2.1	62.7	65.5
	"	0.6	0.9	32.3	33.8
	"	1.2	2.3	1.9	1.9
1968-69	"	1.9	6.6	74.9	83.4
	"	1.6	5.5	42.2	49.3
	"	1.2	1.2	1.8	1.7
1969-70	"	3.0	7.8	53.5	64.3
	"	2.3	6.0	41.5	49.8
	"	1.3	1.3	1.3	1.3
1970-71	"	4.1	10.0	62.8	76.9
	"	3.0	7.5	37.5	48.0
	"	1.4	1.3	1.7	1.6
1971-72	"	5.2	8.2	62.6	76.0
	"	4.0	7.5	34.2	45.7
	"	1.3	1.1	1.8	1.7
1972-73	"	5.9	8.8	53.8	68.5
	"	4.5	8.5	28.1	41.1
	"	1.3	1.0	1.9	1.7
Average	"	3.5	7.2	58.9	66.0
	"	2.7	6.0	34.7	40.5
	"	1.3	1.2	1.7	1.6
Percent of Total	Production (1000 M.T.)	3.5	7.3	89.2	100.0
	Harvested Has. (1000 Has.)	4.4	9.9	85.7	100.0

MINISTERIO DE AGRICULTURA Y GANADERIA, DIVISION DE ESTADISTICAS, La Paz, Bolivia, Hector Nogales, September 20, 1973

GRAIN DISTRIBUTION

Little published information is available describing grain movements by Department in Bolivia. The MAG has several unpublished surveys listing a single Department's estimated shipments of certain grains, although the final destination and product form distribution are nebulous. However, from this information Ing. Hector Nogales was able to provide some estimates as to overall market flows for each of the grains. It should be noted that in the 1971 visit we were unable to obtain even guesses from responsible MAG officials on grain flows from production points to markets.

WHEAT: In 1972 it was estimated 46,000 M.T. of wheat was grown in Bolivia, Table 1. Approximately 47.5 percent of this amount was estimated to move off-farm where grown. Almost 98 percent moved to a country assembler, the remainder going to food processors. From the country assembler about 45 percent went to flour mills, 14 percent to trigo-mote (peeled kernel form), 40 percent to chicha (alcoholic drink), and the remainder ground into whole wheat at custom grinders, etc. The mill by-products moved to animal feed uses. Flour enters channels in amounts not estimated but which consists of: a wholesaler to bakery to retailer to consumer, a pasta plant to wholesaler to retailer to consumer, other Government Institutions for distribution such as miners, or direct to bakery, or to wholesaler to retailer to customer as flour.

Since only about five percent of Bolivia's 1971 flour needs were met by milling 11,500 M.T. of domestic wheat (3), impor-

tation of both wheat and flour is a substantial undertaking. In 1971, flour imports were twice the size of wheat imports into the country.

CORN: In 1972 approximately 265,000 M.T. of various corn varieties classified as grain use were harvested, Table A-1. About 56 percent, or 149,000 M.T., was estimated to enter off-farm channels. Again as in wheat, almost the entire amount moved to country assemblers with small amounts moving directly to animal feed processors. From the assembler about 40 percent went to food processors; chicha use was roughly 30 percent, and hominy use was about 10 percent, the remaining amount went for other local food uses. The assemblers delivered the remaining 60 percent to various animal feed suppliers and users. No estimates were made of the food use distribution through retailers or directly to consumers, but most was estimated to pass through 1 to 2 food retailer or street vendor movements before reaching the customer.

BARLEY: In 1972, about 70,000 M.T. of barley for grain purposes was thought to be harvested, Table A-1. It was estimated 61 percent of this amount moved off-farm to the country assembler. However, some purchasing agents for breweries were in fact country assemblers in this process. The country assembler was thought to sell about 70 percent of the 43,000 M.T. to animal feed processors and users, 5 percent for various food uses such as ground meal by custom grinders, and 20 percent or more to breweries for malting use. Retailers are thought to handle only small amounts of barley in off-farm movements.

RICE: In 1972-73 it was estimated 68,500 M.T. of rough rice was grown in Bolivia, Table 3. Of this amount, approximately 85 percent was estimated to move off-the-farm where grown. Most of the grain moved through country assemblers to mills, but a substantial portion estimated at 25 percent, was brought directly to the mills by the grower. Much of this was believed due to the closeness of mills to the grower and the cooperative nature of many of the mills. A small amount, less than one percent, would move in the form of broken grains from the mill to breweries. About 59 percent moves from the mills to wholesalers, while 40 percent moved to a Government purchasing agency. The Government agency distributes about 35 percent back to the wholesalers later in the season and the remainder goes to Government Institutions, such as mines, or is held either for export or carryover as the case may be. Of the 1972-73 crop, none has been exported to date. The wholesaler thus handles almost 75 percent of the milled rice and distributes it to several types of food retailers who in turn sell to customers. This year, the Government agency, ENA[1], is attempting to retail some rice through a store in La Paz on an experimental basis.

SOYBEANS: In 1972 about 1,600 M.T. of soybeans were reportedly grown in Bolivia, Table A-1. It was estimated that 87 percent of the soybeans moved off-farm. About 75 percent of this amount moved through a cooperative assembler type of gathering and the remainder went direct to the processing plant. The processing plant sold the pressed cake to animal feed manufac-

---

1 (ENA, Empresa Nacional del Arroz) National Rice Company

turers or users directly if possible, although some intermediate sale was reported. The soybean oil was sold by the processor to any of several large wholesalers who in turn distributed it to several types of retail outlets.

A market process study of La Paz was carried out in 1967 (2). Bread, vegetable oil, rice, and pasta sales were the only grain and oilseed products surveyed among various items analyzed. At the retail level, tienda keepers were considered the primary sales outlet for these items. Gross margins were estimated at 17.2, 12.1, 15.7, and 14.0 percent respectively for bread, vegetable oil, rice, and pasta.

At the wholesale level, edible oil and rice were the two products analyzed. The two most important suppliers of edible oil were: import house-58 percent and trucker-36 percent. For rice: the trucker-74 percent and local factory-11 percent were most important. At the country assembler level, it was found that the occupation of the buyer at the fair or mill was most often: the country assembler-77 percent compared to a trucker-3 percent. The principal buyer of agricultural products at the farm, was the country assembler in 87 percent of the producers interviewed.

GRAIN UTILIZATION

The supply - utilization balance estimates for wheat, corn, barley, rice and soybeans in Bolivia for the 1971-72 marketing year are shown in Table 4. The surplus or deficit estimate for each grain is obtained by subtracting the market demand from the marketings. Much of the in-

TABLE 4. ESTIMATED SUPPLY AND UTILIZATION OF WHEAT, CORN, BARLEY, RICE AND SOYA 1972.

(1,000 M.T.)

	WHEAT	CORN (grain)	BARLEY (grain)	RICE (rough)	SOYA
Production	49.5	265.0	70.1	68.5	1.6
Home Consumption 1/	26.0	116.6	27.3	10.3	.2
Marketing	23.5	148.4	42.8	58.2	1.4
Market Demand	260.1 2/	160.0 3/	45.2 4/	53.6 5/	31.2 6/
Surplus or (Deficit)	(246.6)	(11.6)	(2.4)	4.4	(29.8)
Imports	221.407	-.-	-.-	-.-	-.-
Exports	-.-	-.-	-.-	-.-	-.-

1/ Estimated by Hector Nogales, Statistical Division of the Ministry of Agriculture and Livestock.

2/ Instituto Nacional del Trigo, Boletin Informativo # 1, La Paz, Bolivia, Julio 1972.

3/ Estimated by F. Niernberger and Lloyd E. Jacobs, USAID, La Paz, Bolivia.

4/ Estimated by F. Niernberger and Lloyd E. Jacobs, USAID, La Paz, Bolivia.

5/ Ministerio de Agricultura y Ganaderia, Oficina de Planeamiento Sectorial, Arroz Estudio AgroEconomico # 5, La Paz, Bolivia, Oct. 1972.

6/ Estimated by Lloyd E. Jacobs from Ministerio de Agricultura y Ganaderia, Oficina de Planeamiento Sectorial, Proyecto de Oleaginosas, # 3, La Paz, Bolivia, October, 1972.

formation developed in Table 4 is based on limited information and perhaps use of the Table is restricted to an overall view of the grain situation in Bolivia (1).

WHEAT: Although Bolivia produced 49,500 M.T. of wheat in 1972, it had an estimated deficit of 246,600 M.T. of wheat, Table 4. To resolve the deficit, 221,407 M.T. of wheat and flour (wheat equivalent), mostly from the United States, were imported. Imports of wheat and flour have averaged over 200,000 M.T. (wheat equivalent) over each of the last six years. Wheat production in Bolivia over the same six years has averaged 51,000 M.T., while the ten-year average (Table A-1) is slightly over 51,000 M.T. It can be concluded that domestic wheat production has not kept up with population growth in Bolivia.

CORN: As pointed out earlier, corn production reported as grain consists of many varieties used for differing food and animal uses. It was estimated that a slight deficit of corn occurred in 1972, Table 4 because of: inability in locating carryover stocks, higher than normal prices occurred during the 1973 harvest, and feed users complained of high prices and inability to purchase needed quantities. It has been stated that higher world prices and especially prices in countries surrounding Bolivia resulted in illegal exports and movements of corn during late fall, and in 1973 to date.

BARLEY: Barley balances were difficult to estimate, Table 4, since MAG was very positive about the reported size of the

crop, and brewery operators were just as positive about inability to purchase 10,000 M.T. of barley annually the last few years. The problem was not resolved during our assignment. The fact exists that breweries are importing increasing quantities of malt each year although they have sufficient malting capacity to meet needs of domestic supplies if barley could be purchased.

RICE: The rice balances have been the bright spot in Bolivian grain production. Excess supplies did cause low returns to producers and shifting out of rice production to other crops in the Santa Cruz area several years ago. Some of the difficulty was due in part to depressed world market prices for lower grades of rice at that time.

Table 4 indicates a surplus position for 1972 of 4,400 M.T. The rice was carried over in Government stocks to 1973 and was marketed domestically. Rice can perhaps be exported in 1973 because of the 1972 carryover and estimates of a good 1973 crop.

SOYBEANS: Soybean production is relatively minor compared to other crops grown in Bolivia. However, production is increasing significantly each year. Demand appears to be large judged by the deficit figure for 1972 shown in Table 4. Vegetable oil demand is satisfied basically through imports, at the present time. Soybean oil of course, would have competition from other oilseeds such as cotton seed, peanuts, sesame, and other local oilseed crops.

STORAGE FACILITIES

Storage facilities in Bolivia are basically controlled by business firms. The exception is 26,700 M.T. of silo storage with drying facilities being constructed at Santa Cruz by the Government Rice Agency, ENA. Government agencies and cooperatives lease grain product warehouse storage as needed, although presently it is mainly for milled rice storage.

MAG has not compiled an estimate of on-farm and off-farm grain storage capacity in Bolivia. Until this is done, only figures made available by industry groups, serve to provide estimates of locations and capacities of grain storage facilities.

WHEAT: Wheat storage facilities are located at the milling sites listed in Table 5. Total capacity is estimated at 37,500 M.T. About 30,000 M.T. is warehouse type with the remainder, bulk storage.

CORN: The only known storage capacity for corn is at the cooperative, San Jose Obrero, which has 5 silos of about 260 M.T. each for a total of 1,300 M.T.

BARLEY: Storage of barley is primarily at the breweries. Estimated total storage capacity of the Bolivian breweries is 7,500 M. T. of warehouse type storage.

RICE: Rice storage will be located at Buena Vista and Santa Cruz. It will consist of 26,700 M.T. of silos with drying equipment. The facility is expected to be completed by March, 1974.

Other rice storage is located at the mills. It was estimated at 20 days operating capacity, or a total of 7,500 M.T. of warehouse type.

SOYBEANS: The Guzman plant in Cochabamba has adobe wall, tin roof flat storage of about 1,000 M.T.

PROCESSING FACILITIES

Excess capacity has generally characterized most Bolivian grain processors, especially wheat millers. The facilities visited this trip (1 brewery, 2 flour mills, 1 pasta manufacturer) have technologically old but serviceable units with apparant investment capital available to expand their facilities if needed.

WHEAT: Bolivia has an extimated 119,610 M.T./yr. installed capacity flour mills. However, the amount of wheat actually milled has been about 60,000 M.T. yearly.

TABLE 5. BOLIVIAN FLOUR MILLING CAPACITY & LOCATION

Number	Location	24 hr. capacity M.T.
3	La Paz	185
2	Cochabamba	50
2	Oruro	170
1	Potosi	18
1	Sucre	10
2	Tarija	17
1	Santa Cruz	50
	TOTAL	500

SOURCE: Asociacion de Industriales Molineros, September 5, 1973.

CORN: Small custom grinding mills exist which are used to grind all types of grains, but MAG has not published the estimated capacity of these units. No manufacturers with

the exception of formula feed producers, were found to be using corn as a part of their processes, i.e. starch plant, foundry, brewery, etc.

Estimated processing capacity of prepared feed manufacturers in Bolivia is 25,000 M.T. yearly.

BARLEY: The major processors of barley are the breweries, which utilize barley to make malt for brewing. Usage was estimated at 10,500 M.T. yearly.

RICE: There are 37 rice mills in Bolivia. Twenty-eight are located in Santa Cruz with a capacity of 7,400 qq/10 hrs. seven in Cochabamba with a capacity of 700 qq/10 hrs. and two in La Paz with a capacity of 200 qq/10 hrs. Yearly capacity would be estimated at 83,000 M.T. for 200 10/hrs. operating days.

The breweries use an estimated 600 M.T. yearly of broken rice in their fermentation process.

SOYBEANS: Processing capacity of oilseeds in Bolivia is 19,400 M.T. year (4) on a 200 day basis. Sufficient capacity is apparently available for soybeans at present production levels. Proposals have been made to install a modern 150 M.T./day extraction plant within the next several years to handle proposed increases in soybean production.

MARKETING

WHEAT

Most of the wheat grown in Bolivia is stored and consumed on the farm where it is produced. Most wheat which is marketed is sold by the farmer to assemblers who pick the wheat up at the farm or it is transported by the farmer to local fairs where it is sold to assemblers.

Assemblers may, or may not own a truck but they normally have portable scales and bags. The price of wheat sold at fairs is estimated to bring a 4.5% higher price because of the greater buyer competition. Control of weights is thought to be better at the fairs.

Assemblers provide some credit, and other services, to farmers but the extent of these activities is not known. Changes in the marketing system must take these services into account, particularly in the traditional areas of small farmers.

Grading of wheat by the assemblers is not done on a formal basis and establishment of a more formal system may entail education of farmers to accept price differentials based on grade.

Assemblers sell wheat to flour mills, chicha (a local beverage similar to beer) producers, mote (similar to hominy) producers and others. Wheat sold to flour mills is graded and the price is based upon moisture, extraneous material and test weight.

Flour mills are obligated to buy all local wheat which is offered for sale and pay immediately. Wheat production in the Santa Cruz area has been limited but acreage is increasing. The production will probably be by larger farmers who can truck directly to the new flour mill in Santa Cruz.

The new bulk storage of ENA (the rice marketing institute) should be able to receive, dry and store some wheat for the near future.

Transportation of wheat, like most other products, is by truck. The INT (National Wheat Institute) have estimated freight rates by truck as shown in Table 6.

Considering general road conditions the costs of transportation seem reasonable. Also previous studies* have shown that the competition between truckers is high and many truckers are actually operating at a deficit.

Wheat marketed at the flour mills is distributed in the form of flour to bakers who pick the flour up at the mill. Byproducts are usually sold at the mill to farmers or truckers who resell to farmers. Market outlets for byproducts appear to be good.

Little flour is sold for family use.

Marketing of wheat for other purposes (chicha, mote, etc.) is not well developed because of the small quantities sold at any point.

The price of wheat is established by the government as shown on page 46.

---

* Market Processes in La Paz, Bolivia, Research Report No. 3, Latin American Studies Center, Michigan State Univ., East Lansing, Mich.

TABLE 6. Typical Truck Freight Costs for Wheat

Department	From	To	Distance	Cost/qq
Cochabamba	Tarata	Cochabamba	33 Kms.	$b. 2
Cochabamba	Cliza	Cochabamba	63 Kms.	3
Potosi	Betanzos	Potosi	47 Kms.	3
Chuquisaca	R. Pampa	Sucre	170 Kms.	8
Cochabamba	Totora	Cochabamba	120 Kms.	5
Cochabamba	Aiquile	Cochabamba	217 Kms.	6

Bolivian Wheat Prices

(Pesos per Quintale**, September 1973)

Location	Soft Wheat	Semi-hard Wheat
Mill	100	110
Farmer	80	85

Farmer prices are probably below the officially established prices. A study by INT showed that farmers in Redencion Pampa (Zudanez Province, Chuquisaca Department) received about $b.65/cwt when the price at the Sucre mill was $b. 105/cwt. In another report assemblers were paying $b.280 to 300/fanegada (112 kg) and selling at the mill for $b.361 to 402/fanegada.

Flour mills sell at a fixed price. The retail price of flour is fixed at $b.126.50/qq. The wholesaler is allowed a commission of 2%.

Flour mills receive a subsidy of $b.25 which is paid by INT. The flour mills also are allowed to keep the byproducts. Of the price of 110 (or 100) paid by the flour mills the INT receive back $b.5 to be used to operate the INT.

The price of bread is fixed at $b.0.25 per loaf of 250 grams.

Because of the discrepancy between the legally fixed farm price and the actual farm price the INT have proposed the construction of six buying stations in major wheat production areas. This feasibility study was completed just at the time of this study and was reviewed by the authors and representatives of the INT.

The wheat marketing proposal is entitled "Proposal for the Installation of Assembly Centers and the Marketing of the National Wheat Pro-

** Based upon an exchange rate of 20 pesos/1 US Dollar and 46 Kg/qq.

duction," it was prepared by the Department of Economic Studies, Statistics and Marketing of INT on September 17, 1973. A copy of the study is shown in the Appendix.

The study proposes that the six buying stations would purchase about 6700 MT of wheat and would show a net profit of about one million pesos.

The study was reviewed in detail by the authors and discussed with representatives of INT. The following major points were discussed include:

1. Physical facility changes which were discussed include
   a. Addition of an open roofed area at one end of the building where grain could be resacked without creating so much dust in the main storage building.
   b. Adding a device for resacking grain from farmers sacks and including a platform scale of about 200 Kg. capacity for the resacking operation.
   c. Omitting the plastering of brick walls and check the price of adobe walls which would be plastered.
   d. Consider raising wall height to 5 meters so grain can be piled to 4 meters and still be inspected from the top.
   e. Budgeting the use of sacks for 4 to 6 usages seems high. Sacks should not be included in fixed costs but rather in operating costs.
2. The amount of wheat to be purchased through these centers appears to be high. They are budgeted to purchase about one-third of the total wheat marketed in the country and probably a much higher percentage of the wheat marketed within a reasonable radius of the stations.

3. It was pointed out that for the stations near Cochabamba the farmers could probably make a profit of 5 to 10 pesos/qq by trucking directly to one of the local flour mills.

4. Personnel costs do not reflect a true cost. INT plans to use regular personnel from the area to operate these stations and only per diem costs are included for supervisory personnel.

   If the volumes which are budgeted are reached then an average of one sack each two minutes will be handled in some centers. It is doubtful if enough unskilled labor has been budgeted.

5. This system would provide much needed marketing data, such as:

   a. How much of a tie does the assembler have to the farmer through such avenues as credit.

   b. Over what radius can such a marketing center have an influence.

   c. How will grain be delivered--burro, truck, etc.

   d. What will be the rate at which grain will be delivered--time of day, day of week, week after harvest, etc.

   e. What will be the problem of farmers accepting checks which cannot be readily cashed at local banks.

   f. What will be problems of training graders and educating farmers to accept grades.

   g. Can trucks be organized to deliver grain to mills.

   h. What problems will arise in getting adequate supervision.

   It is evident that small buying centers such as this will answer many questions and will undoubtedly raise many more.

For this reason, these stations would be a valuable research project and would probably be justified even though they do not make a profit. If they have been improperly located, the physical facilities should have a high salvage value. The buildings could easily be converted to other uses and the mechanical equipment can be moved readily.

Because of the research nature of this project it would be possible to reduce the number of stations without losing too much information. For example, the two stations near Cochabamba serve very similar areas.

CORN

Corn is a traditional crop in Bolivia and is used for human food and animal feed. In general the hard corn varieties are used for feed and soft corn is used for human food. Data for soft corn production is combined with sweet corn so it is impossible to estimate actual amounts of the soft corn which is used for food.

Corn production is not commercialized so the problem of marketing is similar to the marketing of wheat in the traditional areas.

Assemblers buy corn from farmers at the farm or at country fairs and transport to urban markets. Some corn is ground in small mills and sold for human food. Human food uses include the use in soups, hominy and a hot breakfast cereal. Considerable corn is used in Chicha production.

Price data for August 1973 has been reported as follows:

Santa Cruz - City	$b. 64/qq
Santa Cruz - North	48
Vallegrande - Santa Cruz	52
Chuquisaca - Monteagudo	40
Tarija - Yacuiba	40
Cochabamba - City	72

Year to year prices have varied drastically as shown:

Price and Production Data

Year	Price, $b./qq	Production, MT
1971	15*	192,120
1972	24*	151,250
1973	60	193,700

Most of the corn is stored on the farm until sold to assemblers soon after harvest. The cooperative San Jose Obrero has 5 silos of 324 cubic meters (260 MT) capacity each. Obviously considerable off farm storage exists but no data is available regarding the extent or location of this storage. It is probable that it is scattered widely and is in small units.

Transportation of corn from farm, or fair, to consumption centers is by truck. Typical freight rates are shown below:

Origin	Destination	Distance	Freight
Monteagudo-Chuquisaca	Cochabamba	690 Km.	$b. 27.00/qq
Camiri	Cochabamba	837 Km.	23.50
Mairana - Santa Cruz	Cochabamba	365 Km.	5.00
Mairana - Santa Cruz	Santa Cruz	135 Km.	5.00

---

* 1971 - 72 prices based on $b.12/$US,
1973 on $b.20/$US

Movement of corn from storage to point of utilization has not been documented. It probably remains largely in the hands of assemblers until it is disposed of at retail markets, animal production farms, feed mills and processors such as Chicha producers. Corn differs greatly from wheat in that most of the wheat is disposed of at flour mills and these are very limited in number and have a fairly large amount of storage.

It is evident that prices have varied widely from year to year and location to location. Considering the tonnages involved, the marketing of corn is a greater problem than the marketing of any other grain.

It is evident from the price variation experienced that some price support program and/or economics of marketing might contribute to a more stable production. Since this is the major feed grain, stability of price and production should contribute to the growth of the livestock industry.

A major reason for considering the inclusion of corn in the grain marketing system is to greatly increase the volume handled and spread overhead costs over larger tonnages.

Including corn in the marketing system will require that a grading system be established and graders trained. Realistic price differentials for various grades will have to be established.

The rice elevator at Santa Cruz will probably not be used to capacity the first year. It could be used to purchase corn since the facilities are suitable. If funds available to purchase rice are

not used for rice, they should be available and sufficient to purchase corn. Grades would have to be established and graders trained but there should be sufficient time between now and next harvest to do this.

The assembly centers proposed by INT would be adequate to purchase corn but the disposal problem would be different than for wheat which is simply delivered to flour mills. Some quantity could probably be pre-contracted with larger feed mills and chicha producers. For the first year or two commercial warehouses might be used on a lease basis.

Since prices have not been established for corn, prices should be set with these factors in mind:

1. The price should be high enough to protect farmers against large losses, that is, at about production cost.
2. Prices should be set to include freight costs to final markets.
3. Prices should be set to include a storage cost margin.
4. World market prices should be observed to determine probable losses if surplus grain must be exported. Chicago futures can be a valuable guide.

BARLEY

Barley is an important crop in Bolivia and is grown throughout the Altiplano area. Areas per farm are small but total production exceeds that of wheat. Most of the crop of 70,000 M.T. is used for animal feed but breweries buy about 10,000 M.T. The La Paz brewery buys all barley tendered and uses buying agents to buy barley in other areas. They

have been unable to buy enough local barley and have purchased malted barley from Peru and Argentina (these countries only allow the export of malt). Purchases of malt by the La Paz brewery were 600 MT in 1971, 1200 MT in 1972 and 1700 MT (estimated) in 1973.

Estimated Barley Production and Prices

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
1,000 MT	55	59	55	50	54	61	61	66	70	-.-
$b/qq	32	33	34	34	36	38	40	45	45	62

The authors were unable to determine why the breweries were unable to buy more than about one-seventh of the national production.

Barley probably is used primarily as animal feed on the farm, or in the area, where it is produced. Agents, or assemblers seem to be the major commercial marketing channel. Barley is stored on the farm and probably for longer periods than wheat. The breweries have limited storage but not enough for their annual requirements.

Transportation to the brewery is by truck.

Barley delivered to the brewery by farmers is graded and paid for immediately.

The La Paz brewery checks grain for moisture but find that practically all grain is below 12% moisture.

Samples are size graded on slotted hole sieves and typical sizes are:

Use			Typical Percentages
Used for malting	1st. Class	> 2.8 mm	80%
	2nd. Class	> 2.5 mm	15%

Use			Typical Percentages
Sold for Feed	3rd. Class	> 2.2 mm	5-6% including
	4th. Class	< 2.2 mm	2-3% foreign material

Farmers are docked for 3rd and 4th class (and foreign material) since this is not used for brewing.

When the barley is cleaned the kernels smaller than 2.5 mm and screenings are sold as animal feed.

The brewery makes a germination test on all lots and lots which do not germinate more than about 90-95% are not malted. The brewery resells rejected lots for feed but this test does not affect the farmer.

The brewery reported that they had paid $b.75/qq in 1971 and 1972 and were paying 60-65 this year in Cochabamba which would price it into La Paz at 70-75.

One major unanswered question is why it has been so difficult for the breweries to buy more than one-seventh of the national production. A more effective marketing system might help and the same assembly centers proposed for wheat should be able to handle barley. The marketing of the barley would be similar to that of wheat in that it would go to a limited number of customers.

RICE

Rice production is concentrated in the Santa Cruz area and the production has shifted in recent years from large to smaller farms. The larger farms have shifted to cotton which has been more profitable recently.

The last reported import of rice was in 1962 and since that date production has been great enough to supply local demand and some occasional export.

Rice may be sold through private channels or through the National Rice Company (ENA).

The public marketing of rice has had a varied history and has included the following: the rice cooperatives, FENCA, the Banco Agricola, the National Rice Marketing Committee (CONCA), National Rice Committee (CONAR) and currently the National Rice Company (ENA, Empresa Nacional del Arroz).

At times two large trading companies, Grace and Hansa, have been active in large scale marketing.

This varied history has probably been due to a lack of timely and adequate financing of various agencies. Because of poor financing it was impossible for some of the agencies to provide necessary continuity for a successful operation.

In the past the traditional system for marketing rice from the farm followed these main paths:

1. The farmer sold to an assembler at the farm. Frequently credit advances are made by the assembler.
2. The farmer may transport to the mill and sell to the mill or to speculators. The rice is then dried, usually sun drying on patios, before milling.
3. The farmer can take his rice to the mill, tend to the drying, have it milled and then sell the milled rice to a private or public marketing agency. This system requires that the farmer spend a considerable amount of time at the mill waiting for drying space, tending the grain during drying and waiting for it to be milled. The total wait involved may run into weeks,

Because of the difficulties which the farmer encountered in trying to maintain title during drying, and milling, he frequently sold paddy rice at 30-40% less than he would have received if he had maintained title until the rice was milled.

The new 27,000 M.T. bulk facilities for rough rice being constructed by ENA should provide a very attractive alternative to the farmer. He will be able to deliver rough rice, have it graded and be paid. ENA will then dry and store the rice, have it milled and then transport it and store it in major consumption centers.

It is difficult to store milled rice in the Santa Cruz area because of high humidity and insects. Most rice is, and should be, transported to higher elevations as soon as possible.

Transportation of rice is by truck and prices have been set to cover a freight margin.

Rice moves from mills to consumption centers through private chan nels and is distributed through wholesalers and retailers.

ENA will sell to wholesalers and has also established a retail store in La Paz.

Mills. The number of rice mills has increased from one in 1959 to 37 today. Twenty-eight mills with a capacity of 7400 qq/day (10 hr.) are located in Santa Cruz; 7 with a capacity of 700 qq are in Cochabamba; 2 with a capacity of 200 qq are in La Paz. The mills are primarily equipped with Brazilian machinery and are privately owned. ENA has an employee at each mill to purchase rice and to control the collection of taxes.

The mills are equipped with rubber hullers and Engelberg type polishers.

ENA. This new rice marketing agency was created last year as a national rice marketing company. Since ENA was created only a short time before the rice harvesting season, they were not in the market during the period of harvest from January to March and only purchased about 50% of the crop or 16,500 M.T. before September 3, 1973. ENA plans to market most of their purchases during the last quarter of the year. The private merchandizers bought early at lower prices and were able to sell at a lower price than ENA up till September. To date about 4,500 M.T. have been sold by ENA to government agencies such as the Army, COMIBOL and YPFB.

ENA has had time to develop a better storage and marketing system for 1974. As mentioned previously, ENA is constructing a new bulk rice storage facility with a storage capacity of 26,700 M.T. Two vertical column dryers and cleaners are included. This facility has been designed to handle all common local grains. The design is a standard design and has been used satisfactorily in Colombia and other areas. The cost of this facility will be US$1,440,000 excluding 7 Ha. of land.

ENA has leased warehouse space for storage of milled rice as follows:

La Paz	6,800 M.T.
Oruro	10,000 M.T.
Cochabamba	5,400 M.T.
Potosi	1,100 M.T.
Tarija	150 M.T.
Sucre	230 M.T.
TOTAL	23,680 M.T.

This space for milled rice together with the space for rough rice should be adequate for the budgeted purchases of 35,000 M.T. during 1974.

ENA has considered the possibility of installing sun drying facilities if needed at the bulk elevator.

ENA plans to expand the retail marketing system if the retail store in La Paz is a success.

ENA has included a freight margin in their pricing system but no variable storage margins.

Since ENA is an outgrowth of several predecessor agencies they have acquired a core of personnel who are experienced in rice marketing. They also have experienced graders.

Operation of the new bulk elevator will present a few problems not encountered before:

1. Technical personnel experienced in mechanical drying and operation of a bulk facility. Experienced personnel are being actively sought in neighboring countries.
2. Grading wet rough rice is more difficult than grading milled rice.
3. If milling yields have been seriously underestimated then the operation will be less profitable than budgeted.

ENA's listed prices are as follows:

Purchase Prices 1973 in Pesos Bolivianos/qq

	Popular	Buena	Superior	Extra Superior
Gross	99.70	107.70	112.30	127.30
Milling	6.70	6.70	6.70	6.70
FENCA	0.90	0.90	0.90	0.90
ENA	0.10	0.10	0.10	0.10
NET . . .	92.00	100.00	104.60	119.60

Sales Price ENA 1973, Pesos Bolivianos/qq

Popular	La Paz	Oruro	Cochabamba	Santa Cruz
Purchase Price	99.70	99.70	99.70	99.70
Bag	7.10	7.10	7.10	7.10
Margin ENA	19.70	15.00	15.00	15.00
Freight	20.50	18.20	13.00	-.-
Margin, Wholesale	3.00	3.00	3.00	3.00
Margin, Retail	5.00	2.00	2.20	3.50
Retail Price	150.00	145.00	140.00	128.30

Listed Prices for Other Grades

		La Paz	Oruro	Cochabamba	Santa Cruz
Buena	$b.	160.00	153.00	145.20	136.50
Superior		169.80	166.50	160.00	147.50
Extra Superior		178.50	173.20	165.20	156.50

Summary. The marketing of rice is well developed and it is to be hoped that this agency will be financed adequately to continue a profitable operation.

ENA has set up a complete marketing system from the farm to the final consumer.

One question that will still need to be answered is whether the existing assemblers have provided credit or other services which will prevent ENA from reaching it's budgeted volume during the first year or two.

If ENA fails to use it's facilities to capacity then consideration should be given to purchasing some corn or wheat. ENA would need to train some graders. Additional investment should be minimal.

SOYBEANS

Soybeans are not an important crop in Bolivia at the present. This situation must change if the oil mills now under construction and planned are to operate profitably.

The soybean production envisioned will probably be produced on commercial type farms and these farms will have transportation and other resources to enable them to handle the physical problems of marketing.

The oil mills should be able to provide storage facilities for the production as economically as any other agency and will have a great incentive to see that drying and storage practices maintain quality.

Some concern has been expressed that soybean production must be built up gradually to insure supplies for the first year that the oil mill is in operation. If the oil mill will erect its drying and storage facilities before final completion of the processing plant, these storage facilities can be used to assemble and store soybeans for export.

The Ministry of Agriculture may want to consider the establishment of grades for soybeans. Since soybeans are used for the same processing operations in Bolivia and the US the grading system used in the US would probably be useful and could be adopted with little modification The adoption of these standards will also place Bolivia in a position to export soybeans with internationally recognized grades.

OTHER GRAINS

Small volumes of other food grains such as quinoa are marketed. An organized marketing system could not be justified for these minor grains, but when a marketing system is developed for the major grains, the minor grains can be handled with little additional cost. Grading systems would have to be developed.

GRAIN GRADING

A sound grain marketing system requires that some method of determining the value of grain be available. The value of one lot of grain compared to another lot of the same type of grain depends upon many factors of which some of the most important are:

1. Moisture
2. Foreign material (stones, stalks, etc.)
3. Other grains
4. Broken grains
5. Damaged grains (heat damaged, moldy, insect damaged)

Other factors may be of particular importance for specific uses and particularly as these factors affect an industrial use.

In Bolivia, grading standards exist for wheat and milled rice. Grading standards do not exist for other grains such as corn and soybeans.

One important function of Government is to establish grain grading standards. The government will not normally determine the grade of all lots of grain, but will help train grain graders and act as an arbitrator in cases of disagreement over an actual grade.

Grain grades are essential if buyers and sellers are to be treated fairly. If a buyer has to pay the same price for a lot of low value grain as for a lot of high value grain, he is being treated unfairly. Similarily a seller with low quality grain should receive a lower price for his product. Some general factors to be considered in establishing grades will be discussed.

Factors which will be considered in establishing grades should be factors that are of real value to the consumer of the grain. For example, moisture is of major importance because the food value of grain is decreased in direct proportion to the amount of water present. Also high levels of moisture may lead to spoilage or require expensive drying to remove it. On the other hand, other grains or broken grains would not seriously detract from the value of corn to be used as a feed grain.

The number of grades to be established should be kept to a minimum to make the system workable and easily understood. Some factors such as moisture and foreign material can be used to determine a specific grade or can be handled as a dockage from the total weight. For example, it could be possible to place grain of less than 14% moisture in grade 1 and from 14 to 15.5% moisture in grade 2. It would be just as logical to deduct 1% from the weight if grain is 15% moisture when 14% was the base. Similarly grade 1 might call for less than 2% foreign material and grade 2 might allow for 2 to 4% foreign material. Instead of reducing the grade for excess foreign material the price might be reduced by 1% for each percent of foreign material above say the 2% base.

Factors which are selected to become a part of the grade should be easy to determine accurately. Particularly at country buying stations, it would be difficult to train persons to determine grades if the factors cannot be measured easily and accurately. Accuracy and understandability are important too if the grain seller is not sophisticated in understanding the system and the reason for it.

Some factors which may be very important in determining value are simply too difficult to include in a practical grading system. For

example, the quality of the gluten or level of protein, are important factors of bread wheat, but these tests are too difficult to determine at country buying stations. Similarly the germination of malting barley is an important value factor but the test is too difficult to perform at a buying station.

In the United States a fairly extensive grading system has been developed. However, this system has been developed over a period of decades. Many country buying stations will frequently not determine all of the grading factors because of the difficulty of grading the grain as fast as it is received.

In establishing a grading system, the government should work closely with industries which use large quantities of the grain to insure that all important factors are considered, if possible.

In order to introduce a system which will be easy to use and be accepted, it would probably be advantageous to set grades so that the top grade can be met by a large percentage of the producers. The lowest grade should be of distinctly inferior quality. In the US system the lowest grade, Sample Grade, would not normally be used for human food but would be used for animal food or non-food industrial purposes.

Wheat Grades. The existing system seems to be working fairly well and satisfies the purposes of the flour millers. Since it considers important factors of moisture, foreign material and test weight it probably is adequate. It may be a little stringent in regard to test weight and some study might be given to the actual value of this factor. Docking for moisture and foreign materials is reasonable.

Barley. The Bolivian Brewery in La Paz grades on three factors: moisture, foreign material and kernel diameter. They stated that no

grain is received at above 12% moisture so this might be used as the basis at which dockage would start.

They do not use any kernels for malting which pass a 2.5 mm slotted hole sieve. Material passing a 2.5 mm sieve might be considered as broken grain and foreign material and combined with the other foreign material and other grains to give an overall dockage weight. Most lots will not contain more than 5 to 6% of material less than 2.5 mm so 6% might be a basis for beginning to dock.

Moldy and insect damaged grains would probably indicate a possibility of poor storage (and consequent lowered viability). A limit for moldy and insect damaged grain should be established at some reasonable limit of say 5 to 10% for the number 1 grade.

If moisture, extraneous material and broken kernels are handled as dockage then three grades would probably be sufficient. No. 1 would be good malting barley, No. 2 would be poorer due to lowered viability because of insect damage and molding. No. 3 would probably be too poor for brewery use and would become a feed grain grade.

Corn, dent. Important factors which will decrease the value of corn for food or feed include: moisture, foreign material and other grains. Test weight is included in the US grading standard but this is probably not a factor which correlates well with nutritive value. (Low test weight frequently is associated with harvest of immature grain; this immaturity usually produces a high fiber content but higher protein content.)

Very fine pieces of broken grain as well as fine foreign material could be removed by the standard 12/64 in. round hole sieve used in the U.S. grades.

Moldy grains and insect damaged grains may occur frequently in corn originating in the Santa Cruz area and stored under poor conditions. Rodent (and insect) damage may lower nutritive value because this damage generally occurs first in the germ which contains a relatively high protein and B-vitamin content. Energy values per pound of grain are probably not seriously affected.

Mold may indicate a possibility of the presence of mycotoxins such as aflatoxins or others. There is not a direct relation because very moldy grain may not contain toxins and toxins may exist in grains which do not show visible evidence of mold.

Treating insect damaged and moldy kernels as dockage is probably too severe a penalty to apply. A better solution might be to allow 5% moldy and damaged kernels in a No. 1 grade, 5 - 18% in No. 2 and over 18% in No. 3 which then would probably become essentially a feed rather than food grade.

If the above allowance for damaged kernels were used, then the allowance of 5% damaged kernels would place US Grades 1 and 2 in the Grade 1, US Grades 3,4 and 5 in Grade 2 and US Grade "Sample" in Grade 3.

The value of damaged kernels is obviously less than the value of good kernels. Recent price quotations on the Kansas City market show a price of $2.57/bu for No. 2 yellow corn and $2.42 for No. 4 corn. No. 2 corn allows 15.5% moisture and No. 4 allows 20% moisture. If the price of No. 2 corn is discounted 4.5% to allow for the added moisture the value of No. 4 corn would be $2.46 (2.57 - .045 x 2.57). This indicates a possible price reduction of only $.04/bu due to a 10% increase in damaged kernels plus some additional foreign material, etc. Never-

theless, the price discount, excluding moisture, is presently no more than 2% for a possible increase from 5% damaged kernels to 10% damaged kernels. On this basis damaged kernels are discounted 50% in value.

U. S. corn grades are shown in Table 7.

Corn, sweet or non-dent. About the same factors apply as for dent corn. Since this corn is used more for food purposes the grades might be a little more stringent in regard to damaged kernels.

Rice. Existing grades are established on the basis of the quality of milled samples. With the new bulk storage facilities for rough rice grades will require some modification. Rough wet rice cannot be milled before grading. The drying would be time consuming. The wet rice could be shelled (hull removed) and all important factors except heat damaged kernels could be determined. Heating during a short period of high moisture storage can cause discolored kernels which cannot be detected before milling. Heat damage during storage would probably be detectable by the odor of the samples. Samples showing odor should be dried and milled before grading. This problem of having to mill before grading does not occur when the identity of ownership is preserved through drying as is now generally done in Bolivia and the U.S. The new bulk storage in Santa Cruz will not permit identity to be preserved.

Other Grains. Bolivia has a few unique grains such as quinoa which have not been subjected to commercial grading and marketing here or in other countries. If these grains are to be subjected to commercial marketing then grading standards will have to be established based upon factors discussed above.

Recommendations. Development of practical grading standards will require several months of time. If a marketing system is to be estab-

TABLE 7. GRADES AND GRADE REQUIREMENTS FOR CORN

GRADE	MINIMUM TEST WEIGHT PER BUSHEL	MAXIMUM LIMITS OF--			
		MOISTURE	BROKEN CORN AND FOREIGN MATERIAL	DAMAGED KERNELS	
				TOTAL	HEAT-DAMAGED KERNELS
	POUNDS	PERCENT	PERCENT	PERCENT	PERCENT
U.S. No. 1-----	56.0	14.0	2.0	3.0	0.1
U.S. No. 2-----	54.0	15.5	3.0	5.0	.2
U.S. No. 3-----	52.0	17.5	4.0	7.0	.5
U.S. No. 4-----	49.0	20.0	5.0	10.0	1.0
U.S. No. 5-----	46.0	23.0	7.0	15.0	3.0
U.S. Sample grade.	U.S. Sample grade shall be corn which does not meet the requirements for any of the grades from U.S. No. 1 to U.S. No. 5, inclusive; or which contains stones; or which is musty, or sour, or heating, or which has any commercially objectionable foreign odor; or which is otherwise of distinctly low quality.				

lished for a grain for which grades do not exist then steps must be taken to establish these grading standards at least six months before any purchasing is contemplated.

A grading standards committee for each grain should be established. This committee should include representatives of affected industries, government and, if possible, farmers' groups.

Some members of this Committee should visit some of the nearby countries to observe the operation of grading systems. Some suggested points include:

1. Colombia, which has developed a grain grading system (which may include too many grades for Bolivian conditions at present). Colombia has also established a good system for the training of grain graders in a course lasting a few months in Bogota.
2. Costa Rica, which has a long history of applying grain grades at small (truck) assembly points. The Costa Rican system may be simpler and closer to the needs of Bolivia at the present.

An important question which must be answered is the actual difference in value (to be reflected in price) between grades. If the government purchases grain it must set these price differentials realistically or it may find itself with unsold stocks of some particular grade which in the opinion of the consumers is overpriced. Some studies should be initiated to determine prices which do exist in the free market now between grain lots of different qualities.

CREDIT

The production trends for grain are disappointing over the past few years. The country has not been able to reduce the purchase of foreign grains (including flour).

Farmers have not generally increased their use of inputs such as fertilizer. Since new arable land is being developed slowly, the best possibility of rapidly increasing grain production is through improved agronomic techniques. These techniques require the farmers to invest capital which few have.

In addition, many low income groups, including farmers require credit for the purchase of consumer goods. Probably a large amount of this credit is presently supplied by the grain assemblers although no data is available.

In any case, it is probable that increasing grain production and establishing a viable grain merchandizing program will require that farmers be provided with new credit sources. Consideration should be given to providing credit through the primary assembly centers. There are several possible advantages:

1. The center operators should become acquainted with the farmers and know their credit needs--particularly for operating credits.
2. When the farmer delivers his grain the credit extended can be collected easily.
3. Some of the credit will be in supplies which cannot be misused as easily as cash.

4. The credit link should help insure that the farmer will market his grain through the grain marketing system.
5. The manager's salary may be prorated to this profit center and thereby help reduce the overhead costs to be applied to grain.

It is not necessarily proposed that the credit be advanced by the grain marketing organization. The organization might simply operate as an agent for some other established credit agency such as Banco Agricola and receive a commission for its services.

1980 PROJECTIONS

DEMAND

The demand for food grain is primarily dependent on population growth and average per-capita consumption. Mixed demand for food and feed purposes such as for corn in Bolivia, is additionally dependent on demands for animal feeds and industrial use.

Population projections for Bolivia by urban and rural division is shown in Table 8.

TABLE 8. PROJECTED POPULATION

(1,000,000 people)

YEAR	URBAN	RURAL	TOTAL
1973	1,608	3,739	5,347
1974	1,666	3,827	5,493
1975	1,727	3,916	5,647
1976	1,790	4,008	5,798
1977	1,855	4,101	5,956
1978	1,912	4,197	6,119
1979	1,992	4,295	6,287
1980	2,064	4,395	6,459

Urban growth is expected to increase and will constitute about one-third of the population by 1980. A population projection by Departments is shown in Table 9. The rate of population growth for all

TABLE 9.

POPULATION PROJECTION OF BOLIVIA BY
DEPARTMENTS (STATES), CAPITALS AND PROVINCES
Years 1971 to 1980
(Thousands of persons)

DEPARTMENTS	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Chuquisaca	474.40	486.80	499.50	512.60	527 90	542.50	557.50	572.90	588.70	604.90
Capital	49.59	50.51	51.45	52.56	53.69	54.85	56.03	57.24	58.47	59.73
Province	424.81	436.29	448.05	460.04	474.21	487.65	501.47	515.66	530.23	545.17
La Paz	1.590.40	1.631.90	1.674.60	1.718.40	1.769.80	1.818.70	1.868.90	1.920.50	1.973.50	2.028.00
Capital	562.60	582.40	602.90	633.10	664.90	698.20	733.20	770.00	808.60	849.20
Province	1.027.80	1.049.50	1.071.70	1.085.30	1.104.90	1.120.50	1.135.70	1.150.50	1.164.90	1.178.80
Cochabamba	822.50	844.00	866.10	888.70	915.30	940.60	966.50	993.20	1.020.70	1.048.90
Capital	170.29	177.09	184.16	192.44	701.09	210.98	220.46	230.37	240.73	251.55
Province	652.21	666.91	681.94	696.26	714.21	729.62	746.04	762.83	779.97	797.35
Oruro	352.60	361.90	371.30	381.00	392.50	403.30	414.40	425.90	437.60	449.70
Capital	94.72	96.79	98.91	101.37	103.89	106.48	109.13	111.85	114.63	117.48
Province	257.88	265.11	272.39	279.63	288.61	296.82	305.27	314.05	322.97	332.22
Potosi	896.10	919.60	943.60	968.30	997.30	1.024.80	1.053.00	1.082.10	1.112.00	1.142.70
Capital	66.10	67.39	68.71	70.23	71.78	73.36	74.98	76.64	78.33	80.06
Province	830.00	852.21	874.89	898.07	925.52	951.44	978.02	1.005.46	1.033.67	1.062.64
Santa Cruz	479.80	492.30	505.20	518.40	533.90	548.60	563.80	579.30	595.30	611.80
Capital	119.96	126.01	132.36	139.03	146.04	153.40	161.13	169.25	177.78	186.74
Province	359.84	366.29	372.84	379.37	387.86	395.20	402.67	410.05	417.52	425.06
Tarija	212.60	218.20	223.90	229.70	236.60	243.10	249.90	256.80	263.90	271.10
Capital	24.20	24.67	25.14	25.69	26.25	26.82	27.40	28.00	28.60	29.22
Province	188.40	193.53	198.76	204.01	210.35	216.28	222.50	228.80	235.30	241.88
Beni	200.90	206.10	211.50	217.10	223.60	229.70	236.10	242.60	249.30	256.20
Capital	18.33	18.84	19.36	19.94	20.54	21.16	21.80	22.46	23.14	23.84
Province	182.57	187.26	192.14	197.16	203.06	208.54	214.30	220.14	226.16	232.36
Pando	33.20	34.10	35.00	35.90	36.90	38.00	39.00	40.10	41.20	42.40
Capital	2.94	3.02	3.10	3.19	3.28	3.38	3.48	3.58	3.69	3.80
Province	30.26	31.08	31.90	32.71	33.62	34.62	35.52	36.52	37.51	38.60
Total Departments	5.062.50	5.194.90	5.330.70	5.470.10	5.633.80	5.789.30	5.949.10	6.113.40	6.282.20	6.455.70
Total Capitals	1.108.73	1.146.72	1.186.09	1.237.55	1.291.46	1.348.63	1.407.61	1.469.39	1.533.97	1.601.62
Total Provinces	3.953.77	4.048.18	4.144.61	4.232.55	4.342.34	4.440.67	4.541.49	4.644.01	4.748.23	4.854.08

Ministry of Agriculture, Agric. Economics Service, Division of Economics, Studies and Agric. Statistics

Departments is assumed to be the same which would indicate little future change in conditions of location of facilities for grain storage throughout Bolivia. It is believed by the authors the basic assumption for the projections is wrong.

The planning studies on wheat, corn, rice, and soybeans (3, 4, 5, and 6) were used to estimate future grain and oilseed demand. The wheat and rice studies were the only ones that showed projected consumption on a national basis. See Table 10 below for data from the studies.

TABLE 10. PROJECTED CONSUMPTION OF WHEAT and RICE IN BOLIVIA, 1973 - 1980

YEAR	Consumption (1,000 M.T.) WHEAT	RICE (rough)
1973	257.1	66.0
1974	266.4	68.5
1975	276.0	71.1
1976	285.9	73.8
1977	296.2	76.7
1978	306.8	79.5
1979	317.9	82.6
1980	329.3	85.8

PRODUCTION

Historical departmental production and yield data previsouly shown have not been gathered for enough years to use regression analysis or simple trend projection techniques to obtain meanginful results for 1980 projections.

TABLE 11 PROJECTION OF WHEAT PRODUCTION, PLANTED AREA AND YIELD BY DEPARTMENT IN BOLIVIA

1972 - 1980

YEAR		Chuquisaca	Cochabamba	Potosí	Santa Cruz	Tarija	Total 1/
1972-73	Production (1000 M.T.)	19.2	28.8	16.4	18.2	4.7	87.3
	Harvested Has (1000 Has.)	22.6	28.9	22.6	10.0	3.9	88.0
	Yield (M.T./Ha.)	0.8	1.0	0.7	1.8	1.2	1.0
1973-74	"	21.9	32.3	18.4	25.5	5.3	103.4
	"	23.5	30.0	23.5	14.0	4.1	95.1
	"	0.9	1.1	0.8	1.8	1.3	1.1
1974-75	"	24.7	36.0	20.8	35.6	5.9	123.0
	"	24.5	31.2	24.5	19.6	4.2	104.0
	"	1.0	1.2	0.8	1.8	1.4	1.2
1975-76	"	27.7	39.9	23.4	49.9	6.5	147.4
	"	25.5	32.5	25.5	27.4	4.4	115.3
	"	1.1	1.2	0.9	1.8	1.5	1.3
1976-77	"	30.8	43.9	26.3	69.8	7.0	177.8
	"	26.5	33.8	26.5	38.4	4.6	129.8
	"	1.2	1.3	1.0	1.8	1.5	1.4
1977-78	"	37.6	60.9	32.8	122.2	9.3	262.8
	"	27.5	35.1	27.5	53.8	4.7	148.6
	"	1.3	1.7	1.2	2.3	2.0	1.8
1978-79	"	41.4	67.0	37.2	136.4	10.0	292.0
	"	28.6	36.5	28.6	60.0	4.9	158.6
	"	1.4	1.8	1.3	2.3	2.1	1.8
1979-80	"	45.5	73.4	42.0	136.4	10.6	307.9
	"	29.8	38.0	29.8	60.0	5.1	162.7
	"	1.5	1.9	1.4	2.3	2.1	1.9
Percent of Total for 1980	Production (1000 M.T.)	14.8	23.8	13.6	44.3	3.5	100.0
	Harvested Has. (1000 Has.)	18.3	23.4	18.3	36.9	3.1	100.0

1/ Total may differ due to rounding of original data.

MINISTERIO DE AGRICULTURA Y GANADERIA, OFICINA DE PLANEAMIENTO SECTORIAL , ESTUDIO DEL TRIGO, No. 2, La Paz, Bolivia, Octubre, 1972.

TABLE 12

PROJECTION OF CORN (grain) PRODUCTION, PLANTED AREA, AND YIELD BY DEPARTMENTS IN BOLIVIA

1972 - 1980

YEAR		Chuquisaca	Cochabamba	Santa Cruz	Tarija	TOTAL 1/
1972-73	Production (1000 M.T.)	63.9	61.9	127.8	50.5	304.1
	Harvested Ha. (1000 Has.)	42.6	37.9	66.9	32.6	179.5
	Yield (M.T./Ha.)	1.5	1.6	1.9	1.6	1.7
1973-74	"	68.1	65.9	136.2	53.8	324.0
	"	45.4	40.4	71.3	34.0	191.1
	"	1.5	1.6	1.9	1.6	1.7
1974-75	"	72.3	70.6	144.5	57.0	343.8
	"	48.2	42.9	75.7	36.1	202.9
	"	1.5	1.6	1.9	1.6	1.7
1975-76	"	76.4	74.0	152.9	60.3	363.7
	"	51.0	45.3	80.1	38.2	214.6
	"	1.5	1.6	1.9	1.6	1.7
1976-77	"	80.6	78.1	161.2	63.6	383.6
	"	38.7	34.4	67.5	29.0	169.7
	"	2.1	2.3	2.4	2.2	2.3
1977-78	"	84.8	82.1	169.6	66.9	403.4
	"	40.7	36.2	71.0	30.5	178.5
	"	2.1	2.3	2.4	2.2	2.3
1978-79	"	89.0	86.2	177.9	70.2	423.3
	"	42.7	38.0	74.5	32.0	187.3
	"	2.1	2.3	2.4	2.2	2.3
1979-80	"	93.1	90.2	186.3	73.5	443.1
	"	44.7	39.6	78.0	33.5	195.8
	"	2.1	2.3	2.4	2.2	2.3
Percent of Total for 1980	Production (1000 M.T.)	21.0	20.4	42.0	16.6	100.0
	Harvested Ha. (1000 Has.)	22.8	20.2	39.9	17.1	100.0

1/ Total may differ due to rounding of original data.

TABLE 13. PROJECTION OF SOYBEAN PRODUCTION, PLANTED AREA AND YIELD BY DEPARTMENTS IN BOLIVIA

1972 - 1980

YEAR		Chuquisaca	Cochabamba	Santa Cruz	Tarija	Country Total
1972-73	Production (1000 M.T.)	-.-	-.-	4.5	-.-	4.5
	Harvested Has. (1000 Has.)	-.-	-.-	3.0	-.-	3.0
	Yield (M.T./Ha.)	-.-	-.-	1.5	-.-	1.5
1973-74	"	1.5	0.1	5.8	7.2	14.6
	"	1.2	0.1	3.9	6.0	11.2
	"	1.3	1.0	1.5	1.2	1.3
1974-75	"	2.5	0.5	6.8	12.0	21.8
	"	2.0	0.4	4.5	10.0	16.9
	"	1.3	1.2	1.5	1.2	1.3
1975-76	"	3.5	0.8	7.6	16.8	28.7
	"	2.8	0.7	5.1	14.0	22.6
	"	1.3	1.2	1.5	1.2	1.3
1976-77	"	7.5	1.1	8.6	24.0	41.2
	"	6.0	0.9	5.7	20.0	32.6
	"	1.3	1.2	1.5	1.2	1.3
1977-78	"	9.6	1.3	10.5	29.7	51.1
	"	6.6	0.9	6.0	22.0	35.5
	"	1.4	1.4	1.8	1.4	1.4
1978-79	"	12.2	1.3	10.5	37.8	61.8
	"	8.4	0.9	6.0	28.0	43.3
	"	1.4	1.4	1.8	1.4	1.4
1979-80	"	12.2	1.4	10.5	37.8	61.9
	"	8.4	1.0	6.0	28.0	43.4
	"	1.4	1.4	1.8	1.4	1.4
Percent of Total for 1980	Production (1000 M.T.)	19.7	2.3	17.0	61.0	100.0
	Harvested Has (1000 Has)	19.4	2.3	13.8	64.5	100.0

1/ Total may differ due to rounding of original data.

MINISTERIO DE AGRICULTURA Y GANADERIA, OFICINA DE PLANEAMIENTO SECTORIAL, PROYECTO DE OLEAGINOSAS, No. 3, La Paz, Bolivia, October, 1972.

TABLE 14. PROJECTION OF BARLEY (grain) AND RICE (rough) PRODUCTION PLANTED AREA, AND YIELD IN BOLIVIA, 1972 - 1980

YEAR		BARLEY 1/	RICE (rough) 2/
1972-73	Production (1000 M.T.)	63.7	79.6
	Harvested Has. (1000 Has.)	95.0	46.0
	Yield (M.T./Ha.)	0.67	1.7
1973-74	"	60.3	82.3
	"	90.0	47.7
	"	0.67	1.7
1974-75	"	57.6	85.1
	"	86.0	49.4
	"	0.67	1.7
1975-76	"	60.9	87.9
	"	87.0	51.2
	"	0.70	1.7
1976-77	"	61.6	91.9
	"	83.0	53.3
	"	0.70	1.7
1977-78	"	62.3	96.9
	"	89.0	55.3
	"	0.72	1.7
1978-79	"	64.8	100.7
	"	90.0	58.9
	"	0.72	1.7
1979-80	"	65.5	105.3
	"	91.0	61.1
	"	0.72	1.7

1/ Estimated by F. Nierenberger, hectares will be reduced in early years due to increased competition from wheat, gradually return as supply decrease changes price relationship with other grains, yield increase minor because of low incentive to specialize.

2/ MINISTERIO DE AGRICULTURA Y GANADERIA, Oficina de Planeamiento Sectorial, Arroz Estudio AgroEconómico, La Paz, Bolivia, October, 1972.

As an alternative, projections of wheat, corn, and soybeans were taken from the Planning studies (3, 4, 5, and 6). The data is shown in Tables 11, 12, and 13. However, rice was not detailed by Department in the studies and barley was not a subject of investigation by the Planning group. The estimates of National production projections for rice and barley are shown in Table 14.

The potential cultivated area and area under cultivation by Departments primarily concerned with the growing of the five crops are listed in Table 15.

TABLE 15. POTENTIAL CULTIVATED AREA AND AREA UNDER CULTIVATION IN THE DEPARTMENTS CONSIDERED FOR WHEAT, CORN, BARLEY, RICE, AND SOYBEANS PRODUCTION 1968

(1,000 Hectares)

DEPARTMENTS	Potential Area	Occupied Area	Difference
Chuquisaca	527	107	420
Cochabamba	583	158	425
La Paz	814	194	620
Potosi	452	176	276
Santa Cruz	809	213	596
Tarija	180	46	134

GRAIN DISTRIBUTION

It was not possible to develop a projected grain balance and distribution network of meaningful nature for Bolivia at this time due to insufficient data and estimates. Items of critical nature were centered around the lack of Department data on production and distribution. Upon examination of existing limited projections previously shown for population (Tables 8 and 9), consumption (Table 10), and production (Tables 11 through 14) it becomes evident that limited confidence can be placed in the realization of the projections or their agreement with actual conditions of the time period at the end of study.

Two bright aspects for future analysis are on the horizon. One, is the sector study and survey on agriculture, undertaken by USAID and presently being prepared for publication, and two, is the great improvement by the Statistics group of MAG in surveying crop production and distribution.

Still lacking though are data on storage facilities and locations, stock positions of the grains, costs on marketing of the various grains (margins could suffice for some analysis), and use of the grains as food (per capita usage). This type of data is best obtained by survey and MAG should place emphasis on first gathering the data before additional projections of the type made in the planning studies are undertaken.

NECESSITY FOR CONSIDERING AGRICULTURAL PRICE ADJUSTMENTS IN BOLIVIA

The wheat price which was set about May 1, 1973 for the 1973 crop was rational and reflected world price conditions at the time. Since about July 15, world market prices for wheat have essentially doubled and have carried other cereal grain prices, e.g. corn and rice, upward in about the same ratio.

Recent quotations for cereal grains have been analyzed to show the pressure which could be exerted to cause grains to leave Bolivia for neighboring countries. This analysis is shown in Table 16.

Table 16 reflects world market prices in Chile and Argentina. It assumes that the countries would be importing these grains and allowing the internal price to reflect these costs. We know that Argentina is controlling the price of wheat and flour but these prices are above Bolivia. No data is available for local prices for these grains in other adjoining countries such as Peru, Brazil, Paraguay and Ecuador.

It is obvious that substantial profits can be made by smuggling domestic grain out of the country (or even smuggling flour produced from U.S. wheat). The profit figure is probably on the low side since grain leaving the country would probably not move back to the ports but only over the border a short distance into any country in which domestic prices reflected world prices.

Table 17 has been prepared to show the domestic prices which would be required to entirely eliminate any potential profit being made by exporting grain from La Paz back toward Buenos Aires or Matarani.

TABLE 16. Price of Grain Moving From U.S. Gulf Ports Toward La Paz ($US/M.T.)

Grain	U.S. Gulf	Matarani	La Paz	Domestic Grain Price	Domestic Grain Shipped to Matarani	Net Profit to Export Domestic Grain to Matarani
Wheat	205	236	258	111	133	103
Corn	117	148	170	75	97	51
Rice	615 *	646	668	201 **	223	423

* Long Grain, Texas Mills, September 10

** Cochabamba Price

Grain	U.S. Gulf	Buenos Aires	La Paz	Domestic Grain Price	Domestic Grain Shipped to Buenos Aires	Net Profit to Export Domestic Grain to Buenos Aires
Wheat	205	230	257	111	138	92
Corn	117	142	169	75	108	34
Rice	615	640	667	201	228	412

TABLE 17. Domestic Prices Required to Reflect World Market Prices and Reduce Dangers of Local Grain Exports. (Price $US/MT)

Grain	Matarani	Less Frt. La Paz-Matarani	La Paz $b/qq
Wheat	236	214	195
Corn	148	126	115
Rice	646	624	568

Grain	Buenos Aires	Less Frt. La Paz-Buenos Aires	La Paz $b/qq
Wheat	230	203	185
Corn	142	115	105
Rice	640	613	550

Pricing of grains in isolation from world markets and surrounding country demands has not been satisfactorily resolved in any country to our knowledge. Surplus domestic grains when bought and priced above world markets require costly storage facilities to hold until world conditions change. Surplus grain priced below world markets usually enter private traders hands and are exported either legally or illegally as the laws exist. Deficit grain situations where domestic grains are priced above world prices lead to legal or illegal imports and occasional depressing conditions on domestic supply if not properly coordinated, but more importantly are costly to the Government unless production response is forthcoming at a satisfactory growth rate, i.e. high prices in conjunction with inefficient production does not lead to increased production as net returns to the grower can be unsatisfactory. Deficit grains situations where domestic grains are priced below world prices again leads to legal or illegal exports and may well stagnate production response or lead to much slower than possible production growth rates.

Finally an analysis of each grain is needed to determine if production should be at a surplus or deficit level compared to alternate uses of the land and resources. Also once determined, prices of substituting crops must be kept in ratio to avoid substitution.

RECOMMENDATIONS

With the exception of rice, grain marketing systems are not well developed for maximum efficiency in Bolivia. Whether a technologically improved marketing system is justified at this time is still not definite. On the basis of this study the following recommendations are made:

1. The National Rice Marketing Company is well organized, has a cadre of experienced personnel, a proven system of records and transaction, and is generally well equipped with physical facilities. It should be vigorously supported to insure adequate and timely operating funds. ENA should prepare for the possibility, or contingency, of purchasing corn and wheat if planned bulk storage facilities have excess capacity for storage of grains other than rice.
2. Basic data regarding production, distribution, and consumption of grains is too limited to reasonably establish location and size of purchasing centers, secondary storages and final distribution systems. Intensive efforts should be made to acquire the basic data.

   Production data recently gathered for several grains on a Department basis is also needed for the remaining grains to analyze total volume of grains to be handled through an integrated marketing system. Estimates could then be made on monthly marketings of grain by Departments to determine size of facilities required.

Again a start has been made on estimated movements of grain from Department to Department to obtain surplus or deficit positions at a few points but much remains to be done. Furthermore, the demand or end uses of the grains has not been sufficiently detailed to obtain Department grain balance positions. This implies some form of stock position data which may be easier to obtain under a central marketing agency.

Finally, the marketing channels and percentage of crop movement that the various grains move through i.e. assemblers, wholesalers, truckers, etc. should be estimated on a periodic basis to provide data for determining the immediate effect and possible direction of marketing practices proposed. Costs of the various marketing functions performed should be estimated, or margins obtained.

If all of these activities are carried out, a base will be available to make sufficiently detailed projections of grain production, grain demands, and grain balances so that medium-range and long-term marketing programs including operation of storage and distribution centers can have a reasonable expectation of success.

3. Much basic data required for estimating operating costs of primary country assembly points (purchasing centers) is lacking. Some of the required data will be supplied if Recommendation 2, above, is carried out. Other data which is needed is discussed under the section on wheat marketing. We recommend that pilot purchasing stations be established in the traditional farming area. It should be realized that this is a

pilot program to gather essential marketing data and that operating losses may occur the first few years.

4. Establishment of an integrated grain marketing system will require development of a grading system for all grains to be handled. Developing these grades will require a period of at least one year. Grades for corn are of first priority. The agency responsible for this should probably be a separate agency for development of these standards and training of grain graders.

5. Price reporting has not been well developed. A crop and price reporting service which reported prices existing at various marketing points throughout the country on a weekly basis would guide farmers in their marketing and negotiations with existing assemblers. This information can be disseminated to farmers through local radio stations on a regular basis. Priority should be given to the areas where primary country assembly points will be located.

6. Consideration should be given to the efficiencies which would be inherent in combining all grain merchandising under one agency. This should insure the maximum utilization of personnel, facilities and operating capital. This merchandising agency should consider operating throughout the entire marketing span: Beginning with purchasing from the farmer; through drying, cleaning, and storing; to selling to processors, wholesalers and retailers; and even perhaps retailing, exporting and importing control. The initial recommendation for the

the type of board would be: A grain Marketing Board operating in competition with private traders, varying from physical control of large percentages of the crop of rice and wheat to lesser amounts of corn and barley to probably only regulation control of soybeans.

7. In many countries, the overhead costs of primary assembly centers are too high to be borne by grain merchandising alone. For this reason, these centers also serve for marketing farm supplies such as fertilizers, herbicides and farm equipment. Farm supply merchandising services and valuable function of service to farmers.

8. Credit may need to be provided to supply a service now provided by the assembler. The pilot buying stations will shed some light on the requirements in this area.

9. Prices established for grains need to be examined immediately. Bolivian grain prices are far under world market prices and the danger of smuggling foodstuffs out of the country is great.

10. A long range policy of grain pricing needs to be developed. These prices should provide for realistic marketing costs including transportation and storage.

R E F E R E N C E S

1. Jacobs, Lloyd E., Wheat, Rice, Corn, Barley. Unpublished Papers prepared on Marketing of Cereals, USAID, La Paz, Bolivia, September, 1973.
2. Latin American Studies Center, Market Processes in La Paz, Bolivia, Research Report No. 3, Michigan State University, East Lansing, Michigan.
3. Ministerio de Agricultura y Ganaderia, Oficina de Planeamiento Sectorial, Estudio del Trigo, #2, La Paz, Bolivia, October, 1972.
4. Ministerio de Agricultura y Ganaderia, Oficina de Planeamiento Sectorial, Proyecto de Oleaginosas, #3, La Paz, Bolivia, October, 1972.
5. Ministerio de Agricultura y Ganaderia, Oficina de Planeamiento Sectorial, Proyecto Arroz-Estudio Agro Economico, #5, La Paz, Bolivia, October, 1972.
6. Ministerio de Agricultura y Ganaderia, Oficina de Planeamiento Sectorial, Proyecto Maiz-Estudio Agro Economico, #11, La Paz, Bolivia, October, 1972.

A P P E N D I X

I. Proposal for the Installation of Assembly Centers and the Marketing of the National Wheat Production 93

II. TABLE A-1 Production Harvested Hectares and Yield of Wheat, Corn, Barley, Rice and Soybeans 107

APPENDIX I

Translated From Spanish
By: Lloyd E. Jacobs,
USAID/La Paz

PROPOSAL FOR THE INSTALLATION OF ASSEMBLY CENTERS AND THE MARKETING OF THE NATIONAL WHEAT PRODUCTION

1. BACKGROUND

It is general knowledge that the defective marketing system of wheat, actually existing in our environment, produces substancial economic benefits to the intermediaries or assemblers, who, using traditional forms of buying and selling that have evolved very little since the colonial times, take away income from the producers who, with the use of rational methods, could obtain larger economic benefits that would serve to incentivate the increase of plantings.

Up until the establishment of the new prices, that were established precisely with the objective of increasing the interest of the producer in the traditional area in the farming of wheat, the profit per unit of production, because of the low price that they received from the assemblers, did not constitute sufficient incentive.

The fact, as is quite well known, is that the Comerciante has absorbed the producer by an agile system of purchasing that consists in the advancing of funds before planting; this in money or merchandise, such as clothing and basic foodstuffs. At this time, prices are fixed but they may be readjusted with in very limited margins, but that in any event are very low. For example, in April of this year, in Redencion Pampa (Zudañez province,

Chuquisaca department) the price for one fanega of wheat, equivalent of 185 lbs. was $b.120, that was $b.65 per cwt. The price at the Sucre mill was $b.105/cwt, the cost of freight and bags reached $b.10.50/cwt, thus the liquid profit was $b.29.50/cwt. In many cases the assemblers own a truck, then the profit is obviously higher.

Before getting into the detail of the project, it is necessary to make a rapid analysis of the actual situation of the production, marketing, prices, industrialization, etc. as components of a complex in which marketing plays an important part.

1.1 Production

For the agricultural year 1972-73, plantings are estimated at 70,400 hectares with a production of 59,300 metric tons (Chart 1). Of this amount only 17% is destined for milling, i.e. 10,200 M.T. in 1971-72 (Chart 2), for this reason the national production of wheat, can be considered subsistance for the balance is used as food, wheat hominy, seed and chicha.

1.2 Market

The market for the production of wheat at industrial level, is constituted by the nine mills existing in the country (Chart 3), which have a milling capacity of 120,000 M.T. per year.

1.3 Prices

Actually, there are new prices for the wheats of national production, fixed by Supreme Decree 10850, at $b.100 for soft varieties and $b.110 for semi-hard varieties at the mill, price that includes the subsidy of $b.25 per cwt sold.

2. OBJECTIVES

The objective of the project is to establish a progressive change in the actual form of marketing of wheat in the traditional area (Cochabamba, Chuquisaca, Potosi, Tarija), in which the intermediaries participate, assembling wheat on the farms, communities or fairs and taking it to the mills. Through the participation of a technical state organization controlling the interchange, farmer-miller, a direct system would be established restricting the participation of the assemblers.

3. LOCALIZATION

To select the localities where the assembly centers should be established, the following factors were taken into account: Volume of production, access, location of mills, etc.

DEPARTMENT	PROVINCE	LOCALITY	DISTANCE TO MILL	FREIGHT PER cwt	PURCHASE VOLUME
Cochabamba	Carrasco	Totora	120 Kms	$b 5.=	10,000 qq
	Campero	Aiquile	217 Kms	$b 6.=	15,000 qq
Chuquisaca	Zudanez	R. Pampa	170 Kms	$b 8.=	48,000 qq
Potosi	C.Saavedra	Betanzos	47 Kms	$b 3.=	30,000 qq
Cochabamba	E. Arze	Tarata	33 Kms	$b 2.=	25,000 qq
	Jordan	Cliza	63 Kms	$b 3.=	30,000 qq

4. METHODOLOGY

The assembly centers, equipped with the necessary facilities for the purchase, classification of grain, assembly and handling, should realize the transaction as follows:

4.1 Purchasing System

Direct from the individual farmers of cooperatives, for cash, through the determination of hecto-liter weight, percent of impurities and humidity.

4.2 Sales System

Once the cereal has been purchased by the Institute, it will be delivered to the mills, through an established procedure according to the prices in effect, with a maximum of 60 days credit.

4.3 Price

Considering prices of $b.100 and $b.110/cwt and taking into account assemblers offers of $b.68 and $b.70/cwt the INT can pay between $b.85 and $b.90. Thus increasing $b.17 and 20 to the farmer.

4.4 Control

The INT would permanently control quality, sales volumes and the use of economic resources.

5. BUDGET AND FINANCING

The operating and purchasing budget is $b.13,460,677 (US$659,837); of this $b.11,070,000 is for purchases and will become a rotating fund. The budget can be financed by the funds generated by the donation of 10,000 M.T. made by the European Common Market for the period 1973-74. Considering a price of $b.1,519/M.T. to mills the amount of $b.15,190,000 would be obtained.

ECONOMIC PLAN

The factability of this plan is based in the change in the marketing system, by restricting the intermediaries. Secondly, is the profitability itself, with a margin of profit to cover costs. Also the initial purchasing capital will become a rotating fund for future operations.

Finally, the farmer will receive $b.22 additional per cwt and exact weight will be purchased.

DEPARTMENT OF CHUQUISACA

Location of Purchasing Center:	Zudanez-Redencion Pampa
Estimated Production	3,000 M.T. - 65,100 qq
Probable Volume for Purchase 40% s/total:	1,200 M.T. - 48,000 qq
Destination	Molino SIDS - Sucre
Distance to Mill	170 Kms.
Cost of Freight	$b 8/qq

1. Investment:

Structures: Construction of 3 units @ $b 11,801 per unit (Appendix 1)	$b 335,403
Equipment and Materials (Appendix 2)	26,868
Bags 12,000 @ $b 11/each	132,000
	$b 494,261

2. Operating Capital:

Grain purchases 48,000 qq @ $b 90/qq	$b 4,320.000
Salaries and wages (Appendix 3)	20,700
Freight: 48,000 qq @ $b 8/qq	384,000
Handling: 48,000 qq @ $b 0.25/qq	12,000
	$b 4,736,700

3. Miscellaneous:

Unforeseen: 1% of cost of operation (2)	$b 47,367
Depreciation, amortization, etc. (Appendix 4)	42,728
	$b 90,095

S U M M A R Y

1.	Investment	$b 494,261
2.	Operating capital	4,736,700
3.	Miscellaneous	90,095
	TOTAL	$b 5,321,066

DEPARTMENT OF POTOSI

Location of Purchasing Center:	C. Saavedra-Betanzos
Estimated Production	4,500 M.T. - 97,650 qq
Probable Volume for Purchase 31% s/total:	1,382 M.T. - 30,000 qq
Destination	Molino Rocamador Potosi
Distance to Mill	47 Kms.
Cost of Freight	$b 3/qq

1. Investment:

Structures: Construction of 2 Units @ $b 111,801 per unit	$b 223,602
Equipment and Materials	26,868
Bags 5,000 @ $b 11/each	55,000
	$b 305,470

2. Operating Capital:

Grain Purchases 30,000 qq @ $b 90/qq	$b2,700,000
Salaries and wages	18,000
Freight: 30,000 qq @ $b 3/qq	90,000
Handling: 30,000 qq @ $b 0.25/qq	7,500
	$b2,815,500

3. Miscellaneous:

Unforseen 1% of cost of operation (2)	$b 28,155
Depreciation, amortization, etc.	20,683
	$b 48,838

SUMMARY

1.	Investment	$b 305,470
2.	Operating capital	2,815,500
3.	Miscellaneous	48,838
	TOTAL	$b 3,169,808

DEPARTMENT OF COCHABAMBA

Location of Purchasing Center:	Carrasco -	Totora
	Campero -	Aiquile
Estimated Production	2,800 M.T. -	60,760 qq
Probable Volume for Purchase 41% s/total	1,152 M.T. -	25,000 qq
Destination	Molinos: El Gallo, San Luis IMBA, city of Cochabamba	
Distance to Mill	120 y 217 Kms.	
Cost of Freight	$b 5. = y 6. = qq	

1. Investment:

Structures: Construction of 2 Units @ $b 111,801 per unit (Appendix 1	$b 223,602
Equipment and Materials (Appendix 2)	26,868
Bags 5,000 @ $b 11/each*	55,000
	$b 305,470

2. Operating Capital:

Grain Purchases 25,000 qq @ $b 90/qq	$b 2,250,000
Salaries and wages (Appendix 3)	18,000
Freight: 25,000 qq @ $b 5.50	137,500
Handling: 25,000 qq @ $b .025 qq	6,250
	$b 2,411,750

3. Miscellaneous:

Unforseen 1% of cost of operation	$b 24,117
Depreciation, amortization, etc. (Appendix 4)	20,683
	$b 44,800

S U M M A R Y

1. Investment		$b 305,470
2. Operating capital		2,411,750
3. Miscellaneous		44,800
	TOTAL	$b 2,762,020

* Depreciation based on 4 turn overs/yearly.

DEPARTMENT OF COCHABAMBA

Location of Purchasing Center:	E. Arce - Tarata
Estimated Production	3,200 M.T. - 69,440 qq
Probable Volume for Purchase 36% s/total	1,152 M.T. - 25,000 qq
Destination	Molinos San Luis, Gallo INBA, City of Cochabamba
Distance to Mill	33 Kms.
Cost of Freight	$b 2. = qq

1. Investment:

Structures: Construction of 3 Units @ $b 111,801 per unit	$b 223,602
Equipment and Materials	26,868
Bags 5,000 @ $b 11/each	55,000
	$b 305,470

2. Operating Capital:

Grain Purchases 25,000 qq @ $b 90/qq	$b 2,250,000
Salaries and wages	18,000
Freight: 25,000 qq @ $b 2/qq	50,000
Handling: 25,000 qq @ 0.25 qq	6,250
	$b 2,324,250

3. Miscellaneous:

Unforseen 1% of cost of operation	$b 23,272
Depreciation, amortization, etc.	20,683
	$b 43,955

SUMMARY

1.	Investment	$b 305,470
2.	Operating capital	2,324,250
3.	Miscellaneous	43,955
	TOTAL	$b 2,673,645

DEPARTMENT OF COCHABAMBA

Location of Purchasing Center:	Jordan - Cliza
Estimated Production	2,000 M.T. - 43,000 qq
Probable Volume for Purchase	1,013 M.T. - 20,000 qq
Destination	the city of Cochabamba
Distance to Mill	39 Kms.
Cost of Freight	$b 2/qq

1. Investment:

Structures: Construction of 2 Units @ $b 111,801 per unit	$b 223,602
Equipment and Materials	26,868
Bags 5,000 qq @ $b11/each	55,000
	$b 305,470

2. Operating Capital:

Grain Purchases 20,000 qq @ $b 90/qq	$b 1,800,000
Salaries and wages	18,000
Freight: 20,000 qq @ $b 2/qq	40,000
Handling: 20,000 qq @ $b 0.25 qq	5,000
	$b 1,863,000

3. Miscellaneous:

Unforseen 1% of cost of operation	$b 18,630
Depreciation, amortization, etc.	20,683
	$b 39,313

S U M M A R Y

1.	Investment	$b 305,470
2.	Operating capital	1,863,000
3.	Miscellaneous	39,313
	TOTAL	$b 2,207,783

INDEX I

BUDGETED CONSTRUCTION COSTS OF A STORAGE FACILITY

Measurements:	Length :	15 mts.
	Width :	10 mts.
	Height :	4 mts.
Capacity :	250 M.T.	5.450 qq

Specifications:

Excavation:	17.50 mts^3 @ \$b 25.00/mt^3	\$b 437.00
Foundation:	17.50 mts^3 @ \$b 210.00/mt^3	3,675.00
Groundwork:	7.50 mts^3 @ \$b 290.00/mt^3	2,175.00
Walls :	0.26 mts^3 of thickness 183.50 mts^3 @ \$b 90.00/mt^3	16,515.00
Floor :	Plastered cement 5 cms thick 150 mts^2 @ \$b 150.00/mt^2	22,500.00
Door :	2 of 3 x 3 mts metal 18 mts^2 @ \$b 480.00/mt^2	8,640.00
Roof :	Galvanized 187,50 mts^2 @ \$b 165.00/mt^2	30,937.50
Windows :	Metal Frame 18 mts^2 @ \$b 220.00/mt^2	3,960.00
Plaster :	Interior; cement 183.50 mts^2 @ \$b 47.00/mt^2	8,624.50
	Exterior; cement 183.50 mts^2 @ \$b 38.00/mt^2	6,973.00
Lintels :	Wood, 27.20 mts @ \$b 75.00/mt	2,040.00
	TOTAL	\$b 106,477.00
5% for transport and unforseen		5,323.87
		\$b 111,800.87

INDEX 2.

DETAILED INFORMATION ABOUT EQUIPMENT AND MATERIALS

1.	500 Kg Scale	$b	7,200
	1 - 20 Kg Balance		1,800
	1 Hectoliter balance, ¼ liter		8,160
	1 Moisture tester		6,120
		$b	23,280
2.	1 Probe 40" x 1 3/8", 6 openings	$b	858
	1 Probe 39" x 8 x 17/32", 3 openings		443
	1 Sack probe 6½"		245
	2 Hand truck @ $b 554.		1,108
	Docking sieves, 5 piece		714
	4 Shovels @ $b 55.		220
		$b	26,868

INDEX 3.

SALARIES, WAGES & PER DIEM

1	Grader	100 days per diem	
50	days at $b 90 =	$b 4,500 =	= $b 7,650
50	days at $b 63 =	$b 3,150 =	
1	Accounts clerk	100 days per diem	
50	days at $b 90 =	$b 4,500 =	= $b 7,650
50	days at $b 63 =	$b 3,150 =	
2	Laborers for 3 months		
$b 450 =	per month	$b 2,700 =	= $b 2,700
			$b 18,000

==========

INDEX 4.

DEPRECIATION SCHEDULES

Structures: Equipment and materials	40 years
Scales and lab equipment:	20 years
Hand tools:	10 years

DETAILS OF INCOME, EXPENSES AND PROFITS PER CENTER

DETAILS \ CENTERS	TOTORA	CLIZA	R. PAMPA	BETANZOS	TARATA	TOTAL
Income						
Sale of wheat @ $b 105/qq	2,625,000	2,100,000	5,040,000	3,150,000	2,625,000	15,540,000
Expenses						
Purchase of wheat @ $b 90/qq	2,250,000	1,800,000	4,320,000	2,700,000	2,250,000	13,320,000
Marketing costs	206,550	102,313	506,795	164,338	118,205	1,098,201
Sub Total :	2,456,550	1,902,313	4,826,795	2,864,338	3,368,205	14,418,201
Profit :	168,450	197,687	213,205	285,662	256,795	1,121,799
TOTALS :	2,625,000	2,100,000	5,040,000	3,150,000	2,625,000	15,540,000

BUYING CENTERS: VOLUME, CAPACITY, INVESTMENT AND OPERATING CAPITAL

ITEM	PURCHASING CENTER					TOTAL
	TOTORA	R. PAMPA	BETANZOS	TARATA	CLIZA	
Department	Cochabamba	Chuquisaca	Potosi	Cochabamba	Cochabamba	3
Province	Carrasco	Zudanez	C. Saavedra	E. Arze	Jordan	5
Volume purchased	25,000 qq	48,000 qq	30,000 qq	25,000 qq	20,000 qq	148,000 qq
Storage capacity	5,000 qq	7,500 qq	5,000 qq	5,000 qq	5,000 qq	27,500 qq
Investment						
Buildings	223,602	335,403	223,602	223,602	223,602	1,229,811
Equipment & Materials	26,868	26,868	26,868	26,868	26,868	134,340
Sacks	55,000	132,000	55,000	55,000	55,000	352,000
TOTAL:	305,470	494,271	305,470	305,470	305,470	1,716,151
Operating Capital						
Purchase of wheat	2,250,000	4,320,000	2,700,000	2,250,000	1,800,000	13,320,000
Wages and salaries	18,000	20,700	18,000	18,000	18,000	92,700
Freight	137,500	384,000	90,000	50,000	40,000	701,500
Handling	6,250	12,000	7,500	6,250	5,000	37,000
TOTAL:	2,411,750	4,736,700	2,815,500	2,324,250	1,863,000	14,151,200
Miscellaneous						
Depreciation	20,683	42,728	20,683	20,683	20,683	125,460
Unforseen	44,800	90,095	48,838	43,925	39,313	267,001
TOTAL:	2,762,020	5,321,066	3,169,808	2,673,645	2,207,783	16,134,352

TABLE A-1 PRODUCTION HARVESTED HECTARES AND YIELD OF WHEAT, CORN, BARLEY, RICE AND SOYBEANS

IN BOLIVIA 1962 - 1972

GRAIN		1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72
RICE (milled)	Production (1000 M.T.)	30.0	33.0	35.9	36.2	39.9	45.9	58.4	45.0	53.8	52.2
	Harvested Has. (1000 Has.)	28.5	31.4	32.8	33.5	30.7	33.9	49.3	50.1	48.0	45.7
	Yield (M.T./Ha.)	1.1	1.1	1.1	1 1	1.3	1.4	1.2	0 9	1.1	1.1
WHEAT	"	55.2	57.9	55.0	41.0	27 0	45.0	53.2	62.2	68.5	49.5 2/
	"	106.2	109.2	63.6	74.5	45.0	75.0	76.5	77.6	80.6	57.3
	"	0.5	0.5	0.8	0.6	0.6	0.6	0.7	0.8	0.8	0.9
CORN (grain)	"	270.5	280.2	277.1	268.6	277 7	287.5	289.0	283 0	292.5	265.0
	"	218.0	220.0	214.0	203.2	210 0	217 0	218 4	219.0	225.0	212.0
	"	1.2	1.3	1.3	1 3	1.3	1 3	1 3	1.3	1.3	1.3
BARLEY (grain)	"	55.5	55.0	58 6	55.5	49.6	53.7	61.1 1/	61.5	65.7	70.1
	"	83.3	82.4	88.0	83.3	75.4	80 6	91.7	92.8	98.0	101.0
	"	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
SOYBEANS	"	-.-	-.-	-.-	-.-	3	4	1.2	1.5	1.2	1.6
	"	-.-	-.-	-.-	-.-	.3	.4	0.8	1.0	1.0	1.1
	"	-.-	-.-	-.-	-.-			1.5	1.5	1.5	1.5

1/ Country survey taken 1968-69, all other years estimated.

2/ First year of control 1971-72, previous years estimated.