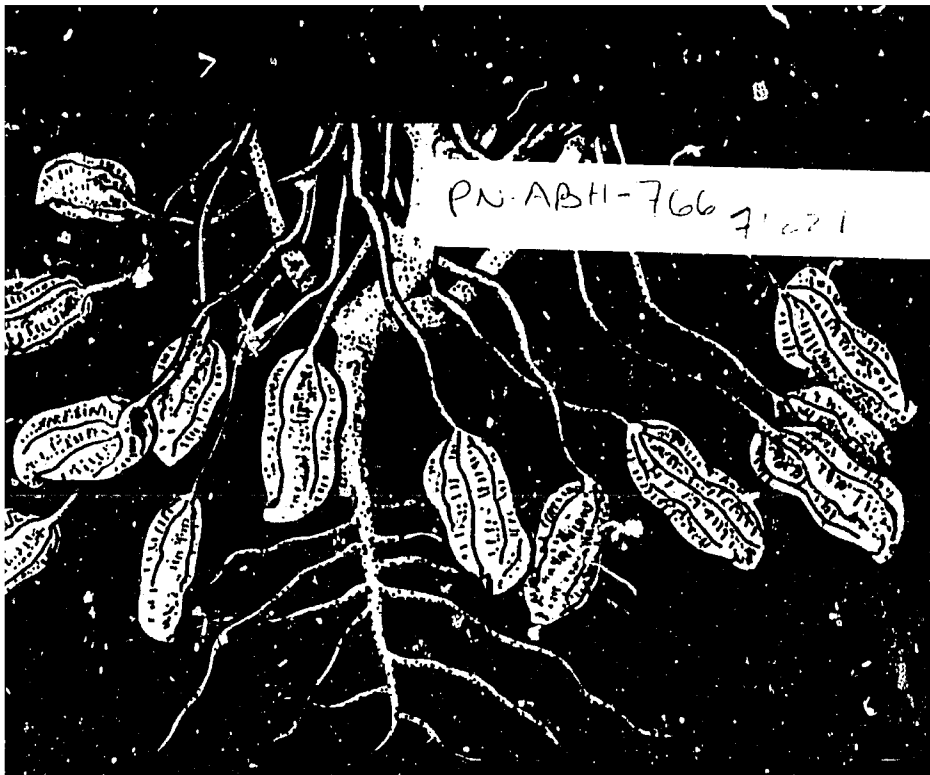

Book Series No. 90/1990

Socioeconomic Study on Peanut Production in the Philippines

Romeo R. Huelgas, Patricia C. Manuel
and Elizabeth S. Gabriel

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY
AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT
Department of Science and Technology

DEPARTMENT OF AGRICULTURAL ECONOMICS
COLLEGE OF ECONOMICS AND MANAGEMENT
UNIVERSITY OF THE PHILIPPINES AT LOS BAÑOS

PEANUT COLLABORATIVE RESEARCH SUPPORT PROGRAM
UNIVERSITY OF GEORGIA, GEORGIA, U.S.A.

OFFICE OF THE EXECUTIVE DIRECTOR

To Our Valued Reader:

This publication, **Socioeconomic Study on Peanut Production in the Philippines,** documents the results of the study conducted by the University of the Philippines at Los Baños.

This study was an evaluation and assessment of the effects of technical and socioeconomic factors in peanut production. It also identified technical factors critical to production, such as variety and management practices used.

We trust that this book would serve as a valuable reference for those interested in peanut production.

Sincerely yours,

RAMON V. VALMAYOR
Executive Director

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Socioeconomic Study on Peanut Production in the Philippines

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Foreword

The Philippines has been growing peanut since the Spanish era. It is one of the major field legumes cultivated by farmers in upland areas. Production, however, remains low and erratic. While yields of about 2 t/ha are feasible, still the farmers harvested an average of only 0.9 t/ha. Many factors were attributed to this situation.

This publication reports the results of the evaluation and assessment of the effects of technical and socioeconomic factors in peanut production conducted by Prof. Romeo R. Huelgas, Dr. Paciencia Manuel, and Ms. Elizabeth S. Gabriel of the Department of Agricultural Economics, College of Economics and Management, University of the Philippines at Los Baños. It identified technical factors critical to production, such as variety and management practices employed. Socioeconomic variables like operating capital and labor were also found important. The study as well as the printing of this publication have been supported by the Peanut Collaborative Research Support Program and PCARRD.

Hopefully, this publication can create awareness of the constraints in peanut growing as well as motivate farmers, researchers, technicians and policy makers to provide corresponding solutions and promote the development of the peanut industry.

RAMON V. VALMAYOR
Executive Director
PCARRD

Acknowledgment

The authors wish to thank the Peanut Collaborative Research Support Program of the United States Agency for International Development and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development for their support which enabled the implementation of this study and the subsequent publication of the findings.

Grateful acknowledgment is also extended to the respondents, whose cooperation was instrumental in getting good data.

Finally, recognition is due to persons who helped directly and indirectly in the research and the publication of the results.

Contents

Abstract

The effects of the technical and socioeconomic factors in peanut production were evaluated.

Peanut farmers got only a production of 0.9 t/ha, indicating a low yield performance compared to the potential output of 2 t/ha. This means that farmers were getting only 47% of the potential output in peanut production.

In terms of profitability, returns above cash costs were ₱829/ha which implied that the cash costs were adequately covered by the cash income.

To measure the constraints in peanut production, a regression analysis using the Cobb Douglas production function was employed. The findings showed that operating capital, farm size, and total labor significantly affected production. The coefficient of determination (R^2) was 72%.

From the equation, the marginal physical and value products were derived. The results revealed that an additional hectarage would increase the total peanut production by 742 kg while an additional peso increase in operating capital can bring about an increase of 0.11 kg in peanut production.

The allocative efficiency of the different variables was also determined. It appeared that, except for labor, there was misallocation of farm inputs among peanut farmers.

In general, the study showed that these identified constraints were brought about by low yield; hence resulting in low income of the peanut producers.

In this regard, the government should give more emphasis on the socioeconomic assessment and evaluation of a given package of technology in order to provide feedback mechanism on the impact of such technology.

Introduction

Peanut (*Arachis hypogaea* L.), locally known in the Philippines as "mani", and pindar, groundnut, and earthnut in other countries is an annual herb noted for the production of underground fruits called pods.

Peanut, boiled or roasted in or out of the shell, is consumed as nuts. Other types of peanut preparations are related to the manufacture of peanut butter, peanut cakes, brittles, and other confectionery preparation. Aside from providing protein, it is considered as the largest source of vegetable oil next to soybeans. It is widely used in the manufacture of cooking oil, salad dressing, margarine, and shortening. Peanut is also used as protein isolates in the fortification of bakery products, milk substitutes, instant food, and simulated meat products.

Despite the various uses and high demand of peanuts, either as food, feed or for industrial products, and the crop's adaptability to Philippine climate, the full exploitation of peanut as a commercial crop has not been fully realized in the country. The national yield level of peanut has always been below 1 t/ha which is often attributed to lack of appropriate technology and use of low-yielding, and pest-susceptible varieties. Although the national yield of peanut has increased from 0.34 t in 1970 to 0.88 t in 1986 (Appendix 1), it is still very low compared to the average yield in other countries, such as Turkey, Japan, and the United States with 2.30 to 2.35 t/ha, respectively.

The peanut production in the Philippines from 1970-1986 showed a fluctuating trend due to change in the hectarage planted to peanut, and mainly because peanut was often grown only as an intercrop with other crops. The highest volume of production was observed only during the early part of the 1980s. This upward trend was due to the government's support through the National Research and Development Program for Legumes launched to

boost local peanut production. However, the peanut production in the country still remains low, which requires importation to meet the domestic requirements.

With the goal of promoting domestic production of peanuts, proper technology is necessary to achieve increased level of production and productivity. Efforts toward the development of the industry should be given priority to regions that are suitable for peanut production. Thus, technical assistance on the adoption of improved and scientific-cultural practices are also needed. Use of high-yielding varieties, proper application of fertilizer, pest control, and efficient crop rotation practices should be disseminated effectively to the farm level. With proper technology and assistance to the producer, enough peanut will be produced to meet the local demand.

In agricultural production, the adaptability and adoption of technology package does not only depend on obtaining highest yield, but also on giving a high net return. In fact, profitability is a measure that farmers greatly consider in the adoption of innovations.

In the development of the peanut industry, the technical aspect of peanut production should not only be assessed, but equally important is the evaluation of the socioeconomic factors that pose as constraints on the productivity level of the crop. Thus, this study aimed to look at these agroclimatic and socioeconomic factors that affect productivity and profitability of the crop.

Peanut-Related Studies

The estimated costs and returns of peanut production in 1976 (Huelgas 1976) revealed that peanut production was both labor intensive and input consuming. In 1986, costs of producing a hectare of peanut were at least ₱13,423 under high management level and ₱8,398 under low management level (PCARRD 1986). For both levels of management, about 62% of the cost were spent for material inputs (i.e. fertilizer, pesticides, etc.), 20% for labor and animal inputs, and 18% for the overhead expenses. Thus, with the above cost outlay, small farmer-producers find it difficult to go into peanut production unless they are either subsidized by the government or vertically integrated with established peanut processors. However, if a farmer will follow the recommended use of inputs, a hectare of peanut can yield an average of 2000 kg and 875 kg under high and low management levels, respectively. Given a support price of ₱12/kg, a net income

of ₱10,577 and ₱2,042, respectively, can be realized in one cropping season. Studies in Isabela, Nueva Ecija, Bohol, Antique, and Zamboanga del Sur on costs of peanut production revealed that the low productivity of peanut in some regions or areas was due to low net returns per hectare and sometimes, a net loss.

A study in Zamboanga del Sur disclosed that the average cost of peanut production varied according to farms size. Farmers with farms of less than 0.5 ha obtained the biggest return of ₱1,645/ha; farms of 0.5-1.0 ha recorded ₱807/ha; and farms bigger than 1.0 ha realized ₱525/ha (Lizarondo et al. 1981).

Moreover, a comparison on costs and returns of traditional and improved varieties (Almeda 1983) revealed that for upland farm, production of traditional variety costs higher than the improved variety, mainly due to intensive labor used in the preparation, care of crops, and harvesting. However, high labor cost was offset by high price. In contrast, the study also revealed that production costs in rainfed farms were apparently higher for improved variety than the traditional variety. This was due to the costs of improved seeds, fertilizer, and intensive labor requirements of the crop. High labor cost was attributed to intensive labor utilization and the higher daily wage rates paid to workers. Costs of labor and material inputs were more than compensated by higher yields.

Results also indicated that peanut productions in both upland and rainfed farms are profitable; both varieties are profitable in upland farms.

Objectives

The study specifically aimed:

1. To identify the constraints to higher yields and the reason why farmers' actual yield is much lower than what is technically feasible;
2. To estimate the resource productivities and allocative efficiencies in the production of peanuts; and
3. To recommend policy measures for the development of the local peanut industry.

Data Sources and Analytical Procedures

The study made use of primary data through actual interviews of 204 peanut farmers using pretested questionnaires. The study areas were Ilocos, Cagayan Valley, Central Luzon, Southern Tagalog, and Central Visayas regions, represented by the provinces of Pangasinan, Cagayan and Isabela, Batangas, Bataan, and Bohol, respectively. However, due to insurgency problems in these areas, uneven samples were obtained from each barangay of every municipality. The province from each region was selected depending on the number of peanut producers and the peace and order situation. Selection of farmer-respondents in each province was done using two-stage sampling procedures. In each province, a list of peanut-producing municipalities was furnished either by the Department of Agriculture or the Bureau of Agricultural Economics provincial office. Identification of peanut-producing barangays was facilitated by the farm management technicians from the said offices.

Given the technology in an area, a wide range of physical (agroclimatic) performance in peanut production can be expected. There maybe farmers who adopted or are adopting the available technology to the maximum feasible land set by physical environment, and thus, obtain the maximum feasible production. These farmers can be characterized as employing the best practice of technology. Varied performance by farmers in employing a given technology under a given set of condition exists owing to the slow adjustment process which accompanies technical change. In small-scale agriculture, the gap between potential and technical change could be due to the institutional and socioeconomic constraints in achieving high level of production.

The best practiced technology could be presented as a frontier production. This corresponds to the technical production

function which is defined as the relationship that describes the greater possible output for a given combination of inputs (Ferguson 1966). Therefore, the frontier production can be considered as the observed standard with which performance of individual farms can be compared.

This study involved two stages of analysis. The first stage examined the technical relationship between peanut production and technical inputs. The factors, such as management and efficiency-related inputs, under socioeconomic category were included in the second stage of regression that tried to explain technical efficiency differences.

The dependent variable Y, output expressed in gross value of production, and in total production in kilograms per farm were regressed against a set of independent variables. Production function was fitted for a sample of 204 farmers.

To measure constraints to increased yields, two regression equations were used:

$$Y_1 = f(X_1, X_2 \ldots X_n, Z_1, Z_2, Z_3 \ldots Z_n, U)$$

$$Y_2 = f(X_1, X_2 \ldots X_n, Z_1, Z_2, Z_3 \ldots Z_n, U)$$

(1) $$Y = a X_1 b^1 X_2 b^2 X_3 b^3 X_4 b^4 X_5 b^5 X_6 b^6 X_7 b^7$$

where:

Y_1 = gross value of production in pesos per farm

a = intercept term

X_1 = area planted with peanut in hectares per farm

X_2 = total labor in mandays per farm

X_3 = operating capital in pesos per farm

X_4 = irrigation (dummy variable 1 with irrigation pump and 0,without irrigation pump)

X_5 = value of fertilizer and chemicals in pesos per farm

X_6 = value of chemicals in pesos per farm

X_7 = fertilizer expenditures in pesos per farm

b_1, b_2, b_3, b_4, b_5 b_6, and b_7 are the regression coefficients of elasticities of production of the input variables X_1, X_2, X_3, X_4, X_5, X_6, and X_7 when the Cobb-Douglas production function was transformed to its double logarithmic form, the yielding equation becomes linear to logarithms as shown below:

$$\ln Y_1 = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + \ln U.$$

where l_n Y = logarithm of gross production

l_n a = constant in logarithm

$l_n X_1$, $l_n X_2$, $l_n X_3$, $l_n X_4$, $l_n X_5$, $l_n X_6$, $l_n X_7$ = logarithm of the respective inputs and b_1, b_2, b_3, b_4, b_5, b_6 and b_7 are production elasticities of the respective inputs.

(2) $Y_2 = a X_1 b_1 + X_2 b_2 + X_3 b_3 + X_4 b_4 + X_5 b_5 + X_6 b_6 + X_7 b_7 + Z_1 b_8 + Z_2 b_9 + Z_3 b_{10} + Z_4 b_{11}$

where:

Y_2 = total production per farm in kilograms

X_1 = farm size in hectares per farm

X_2 = total labor in mandays per farm

X_3 = operating capital in pesos per farm

X_4 = irrigation (dummy variable 1 with irrigation pump, 0 for without pump)

X_6 = value of chemicals in pesos

X_7 = value of fertilizer in pesos

Z_1 = age in years

Z_2 = years in school

Z_3 = years in farming

Z_4 = years in peanut farming

b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_8, b_9, b_{10}, and b_{11} are the regression coefficients of production elasticities of the input variables X_1, X_2, X_3, X_4, X_5, X_6, X_7, Z_1, Z_2, Z_3, and Z_4

When the Cobb-Douglas production function was transformed to its double logarithmic form, the yielding equation becomes linear in logarithms as shown below:

$l_n Y_2 = l_n + a\, b_1 X_1 + b_2 l_n X_2 + b_3 l_n X_3 + b_4 l_n X_4 + b_6 l_n X_6 + n + b_8 l_n Z_1 + b_9 l_n + b_{10} l_n Z_2 + Z_3 + b_{11} l_n + Z_4 + l_n U$

where:

l_n Y = logarithm of total production per farm

l_n a = constant in logarithm in natural form

$l_n X_1$, $l_n X_2$, $l_n X_3$, $l_n X_4$, $l_n X_6$, $l_n X_7$, $l_n Z_1$, $l_n Z_2$, $l_n Z_3$, $l_n Z_4$ = logarithm of respective variables and b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_9, b_{10},

and b_{11} = production elasticities of respective inputs and qualified socioeconomic variables.

From the production function, other concepts can be derived. The marginal product of a factor represents the change in output that results from a small change in any one input holding other inputs constant. The marginal physical product (MPP) of a particular input was obtained by taking the partial derivative of the production function with respect to that input holding other inputs fixed at a given level. Hence, the MPP of input X_1 is given by:

$$MPPX_1 = b_1 \frac{Y}{X}$$

where Y = geometric mean of production per hectare per cropping season

b_1 = regression coefficient of input X_1

The marginal value of product (MVP) was computed directly by multiplying the calculated MPP by the price of the output.

The allocative efficiency of the farm based on the assumption that the farms face the input-output prices is given by the first order condition of profit maximization, thus:

$$MPPx_1 (P_y) = MFCx_1$$

where $MPPx_1$ = marginal physical product of input X_1

P_y = unit price of output Y

MFCx = marginal factor cost of input X_1

This implies that the input should be used up to the point at which the value of its MPP is equal to its price. Significant differences in MVP indicate misallocation of input, i.e., underutilization when MVP is greater than MFC and overutilization when MVP is less than MFC.

The mean efficiency of the farm was derived by taking the technical efficiency of farm i (TEi), which is the ratio of actual output Yi to the best practice or potential output (Yi*) given the best of input used on farming i,

$$TEi = \frac{Xi}{Yi^*}$$

Results and Implications

General Characteristics of Peanut Farmers

The general profile of the peanut farmers in all six provinces studied is presented in Table 1.

Age. The peanut farmers from Bohol were generally older than those from the other five provinces. The farmers in all provinces were, on the average, 44 years old.

Years in school. Peanut farmers from Cagayan had the lowest educational attainment with an average of 3.4 years in school. Farmers from Pangasinan, on the other hand, had the highest educational attainment of seven years, and there were few farmers who attained college education.

Years in farming. Bohol farmers showed the highest average years in farming. For all provinces, the average years in which the peanut farmers were engaged in farming were 23.9 years.

Years in peanut farming. Although farming has always been a part of the lives of the respondents, as shown by the average years they spent on farming, the average years they spent on peanut farming were only 14 years. However, farmers from Isabela spent more years in peanut farming than those from other provinces, with an average of 21.44 years. Farmers from Bohol, on the other hand, spent an average of 9.8 years in farming. There were slight differences in the average years in which the farmers from the other provinces were engaged in peanut farming.

Tenure status. Among the farmers studied, four tenure types existed, namely: owner-operators (50.98%), share tenants (33.33%), leasehold tenants (9.31%), and Certificate of Land Transfer (CLT) holders (6.37%). Majority of the farmers were owner-operators.

Table 1. General characteristics of 204 peanut farmers in different provinces, Philippines, 1985-86.[a]

Characteristic	Isabela	Pangasinan	Bohol	Cagayan	Batangas	Bataan	All Provinces
Number of farmers	49.0	60.0	29.0	18.0	16.0	32.0	204.0
Age (years)	45.5	48.8	55.3	45.1	52.8	44.3	44.0
Years in school	7.0	5.6	6.5	4.3	4.8	5.4	5.5
Years in peanut farming	21.4	14.5	11.3	16.4	15.3	9.8	14.0
Years in farming	25.5	27.3	32.1	21.4	27.8	20.7	23.9
Household size	5.0	4.0	4.0	4.0	5.0	6.0	5.0
Tenure status							
Owner-operator	31 (63.27)	23 (38.33)	19 (65.52)	12 (66.66)	6 (37.50)	13 (40.60)	104 (50.98)
Share-tenant	14 (28.57)	22 (36.37)	9 (31.03)	5 (27.78)	9 (56.25)	9 (28.13)	68 (33.33)
Leasehold tenant	3 (06.12)	6 (10.00)	1 (03.45)	0 (00.00)	0 (00.00)	9 (28.13)	19 (09.31)
CLT holder	1 (02.04)	9 (15.00)	0 (00.00)	1 (05.56)	1 (06.25)	1 (03.13)	13 (06.37)

[a]Figures in parenthesis are in percentages

Characteristics of Peanut Farms

The characteristics of 204 peanut farms are shown in Table 2.

Farm area. The largest average farm area in Bataan and Bohol was 3.39 ha followed by Cagayan and Isabela with an average farm area of 2.17 ha and 2.14 ha, respectively. The smallest average farm area of 0.97 ha was in Batangas. Although the average farm area for all farms studied was 2.24 ha, an average of only 0.94 ha was devoted to peanut farming.

Topography. Almost all of the farms were located in flat areas (83.02%), while the rest were located in rolling (11.27%), hilly (4.41%), and mountainous areas (0.49%).

Source of water. Majority of the farms depended on rain as their source of water for irrigation. Only 15 out of the 204 farms were irrigated through the use of pumps or impounded water from spring, river, or creek.

Soil type. About 61.77% of all farms were reported to have sandy loam and 26.06% of the farms were considered to have clay loam. Since peanut cannot tolerate excessive soil moisture in its entire growth period, the two soil types are suited for peanut production.

Variety planted. The traditional variety was still the popular variety being used by all the farmers interviewed. This was due to the unavailability of improved varieties in their respective provinces.

Road class and accessibility of the farms. Although majority of the roads leading to the farms were made of gravel and sand, the farms studied were relatively accessible by jeeps, tricycles, and even mini-buses. However, the distance from the farm to the nearest roads serves as a constraint in transacting business. The average distances from the farm to the farmer's house, to the nearest road, and to the market are shown in Table 3.

Table 2. Characteristics of 204 peanut farms by province, Philippines 1985-86.

Farm Characteristics	Isabela	Pangasinan	Bataan	Cagayan	Bohol	Batangas	All Provinces
Total farm size (ha)	105 (2.14)	105.85 (1.76)	108.50 (3.39)	48.7 (2.71)	43.50 (3.39)	15.49 (0.97)	47.04 (2.24)
Total peanut farms	62.55 (1.28)	59.29 (0.99)	28.48 (0.92)	19.75 (1.10)	13.31 (0.46)	6.62 (0.41)	191.00 (0.94)
Topography							
Rolling	0	0	0	0	20	3	23 (11.27)
Hilly	4	0	0	0	3	2	9 (4.41)
Mountainous	0	0	1	0	0	0	1 (0.49)
Flat	45	6	31	18	6	11	171 (83.82)
Source of water							
Rain	46	57	25	18	28	14	188 (92.16)
Pump	0	2	2	0	1	2	7 (3.43)
Spring, river or creek	3	1	5	0	0	0	9 (4.41)
Soil type							
Sandy loam	43	52	14	17	0	0	126 (61.76)
Sandy clay loam	1	0	18	0	0	0	19 (9.31)
Clay	0	0	0	1	0	0	1 (0.49)
Clay loam	2	8	0	0	29	16	55 (26.96)
Silty-loam	3	0	0	0	0	0	3 (1.47)
Road class							
Class	0	4	1	0	0	0	5 (2.45)
Asphalt	0	24	8	1	0	3	36 (17.65)
Gravel and sand	49	15	–	15	29	9	138 (67.65)
Trail	0	17	2	2	0	4	25 (12.25)

Table 3. Accessibility of 204 peanut farms by province, Philippines, 1985-86.

Distance (Km)	Isabela	Pangasinan	Bohol	Cagayan	Batangas	Bataan	All Provinces
From farm to house	1.35	0.56	0.42	1.20	0.86	1.43	0.96
From farm to road	0.39	0.79	0.27	0.13	0.59	0.59	0.51
From farm to market	2.66	5.58	2.79	14.45	3.79	9.09	3.26

Peanut Production

Cropping Pattern

Peanut is a relatively short duration crop; the maturity period is about 3-5 months. However, in this study some farmers reported a longer cropping period. The increase in the cropping period was primarily due to the time lag between land preparation and time of planting. Although the land has already been prepared, the farmer had to time the planting of the crop so that it will mature when there is less heavy rainfall, and the soil moisture is sufficient during the productive stage. The cropping seasons followed by the 204 peanut farmers are shown in Table 4.

This study proved that peanut has never been considered as a major cash crop but only as a single crop after rice, intercrop for corn, and alternate crop for sweet potato, mungo, sorghum, or watermelon.

Basic Cultural Practices

Land preparation. Land preparation consisted of clearing, plowing, and harrowing the field. First, the field was freed of weeds by either pulling them by hand or using farm tools, like bolo. Plowing followed to loosen the soil and help uproot the weeds. Harrowing was done two to three times to pulverize the soil and to remove the remaining trashes. Although peanut can germinate in cloddy or not too well-pulverized field (Lantican 1984), the farmers still prefer to plant them in well-prepared and well-pulverized seedbed.

Among the farm operations under land preparation, plowing consumed the highest man-animal days of 11.34/ha.

Table 4. Peanut cropping season, 204 peanut farmers, Philippines, 1985-86.

Peanut Cropping Season	Number of Farms	Percentage
Aug. 1985-Jan. 1986	2	0.98
Sept. - Dec. 1985	12	5.88
Sept. 1985 - Jan. 1986	8	3.92
Sept. 1985 - Feb. 1986	9	4.41
Oct. 1985 - Jan. 1986	5	2.45
Oct. 1985 - Feb. 1986	8	3.92
Oct. 1985 - March 1986	9	4.41
Nov. 1985 - Feb. 1986	14	6.86
Nov. 9185 - April 1986	49	24.02
Dec. 1985 - March 1986	35	17.17
Dec. 1985 - April 1986	15	7.35
Dec. 1985- May 1986	30	14.71
Jan. 1985 - June 1986	8	3.92
Total	204	100.00

Planting the seeds. This was done manually after the furrows were spaced 20-25 cm apart. Two to three seeds were sown per hill which were spaced 15 to 25 cm apart. Planting depth varied from 4-6 cm.

On the average, the farmers set aside about 163.77 kg of unshelled traditional variety of peanut for seeds. About 42% of the peanut farmers reported that they produced the seeds they used in planting. About 19.61% of the farmers applied fertilizer in their peanut farms through basal method during planting. On the average, 6.67 mandays/ha were utilized for planting operation.

Cultivation. This was performed by farmers either manually or through animal-drawn implement. Off-barring was generally done 15-20 days after the plant emerged, to destroy the germinating weeds between the furrows. Hilling up was done immediately after off-barring.

On the average, 1.60 and 0.31 man-animal days were spent on off-barring and hilling-up operations, respectively.

The farmers also practice manual weeding, which was performed generally by the hired labor immediately as the weeds emerged. On a per hectare basis, this activity took about 8.40 mandays to accomplish. None of the farmers applied weedicide or herbicide on their peanut farms.

Water management. Unlike other crops, peanut is a relatively drought-resistant crop. Therefore, this crop can thrive well during the dry season since residual moisture from the rainy days is sufficient to support the vegetative and reproductive processes of the crop, and supplemental irrigation is not needed in most instances. When supplemental irrigation is to be applied, three to four applications may be enough. Irrigation should be applied in these stages: germination, flowering stage, during pod development, and pod filling stages (*The Philippine Recommends for Peanuts*, 1986).

Majority of the farms depended on rain as source of water; only 7.35% of the farms were irrigated.

Fertilization and chemical application. This is not commonly practiced by the farmers in the study areas. Results showed that only 41 respondents (20.10%) applied fertilizer and only 15 respondents (7.35%) applied chemicals to eliminate pests attacking the plants. The reasons given for not applying fertilizers and chemicals included: (1) high cost of fertilizers and chemicals; (2) unfamiliarity with the proper supplementary inputs to use, as well as how to apply them properly; and (3) they observed that fertilizer application to traditional peanut plant only increased the vegetative part of the plant, but without substantial increase in the pod production. Some farmers even reported that the application of fertilizer to peanut plants resulted in lower yields compared to plants without fertilizer.

However, farmers who applied fertilizers in their farms practiced basal application during planting, and sidedressing during the second application. The latter was usually done one month after the plants emerged. The list of fertilizers and chemicals used by farmers are shown in Tables 5 and 6.

On a per hectare basis, about 0.8 mandays were spent on fertilizer application.

Drying and harvesting. According to the farmers interviewed, a good indication that the crop is ready for harvest is when the

Table 5. Kinds of fertilizers used by 41 peanut farmers, Philippines, 1985-86

Kind of Fertilizer	Number of Farmers Who Used Fertilizer	Percentage
Urea (45-0-0)	22	55.00
Complete (14-14-14)	11	26.83
Urea and complete	1	2.50
Ammonium Phosphate (16-20-0)	1	2.50
Ammonium sulfate (21-0-0)	5	12.50
(18-46-0)	1	2.50
Total	41	100.00

Table 6. Kinds of chemicals used by 15 farmers, Philippines, 1985-86.

Kind of Chemical	Number of Farmers Who Used Chemical	Percentage
Azodrin 202-R	2	15.38
Bionex	1	7.69
Decis	1	7.69
Folidol	4	66.66
Lannate	3	23.08
Lannate/Thiodan	1	7.69
Lannate/Gusathion	1	7.69
Thiodan/Azodrin 202-R	1	7.69
Total	15	100.00

leaves withered and have turned yellowish in color, and when the pods are already hard.

Harvesting is usually done by plowing the space between the furrows to loosen the soil. Then, using a shovel, digging tool or pitch fork, the plants were manually pulled.

Farmers who produced their own seeds for planting generally practiced drying. Only 40% of the farmers interviewed reported that they dry their harvested peanut. The two methods of drying practiced by the farmers were: 1) putting the newly harvested peanut plants in windows (loose, continuous rows of uprooted peanut plants placed on the ground); and 2) sun drying the pods on the ground. The farmers refrain from drying their harvested pods on a cemented ground because by doing so, the whole pod including the essential peanut oil in it also dries out.

The pods were picked manually from the pegs right after drying, then the mature seeds were separated from the immature ones. Grading procedure was only limited to sorting out the mature from the immature seeds.

Labor Utilization

There are four sources of labor in peanut production. This study revealed that hired labor was the main source of labor in peanut farming. The family and exchange labor were also utilized in lesser mandays. The total mandays and man-animal days required for the hired labor of the 204 farms were 28.18 mandays/ha (Table 7). This included all operations, which comprised 50.72% of the labor requirements.

Operator's labor was the second most utilized labor source in terms of labor requirements per hectare, constituting 34.25% of all the total requirements. However, the owner-operator has the direct control over his farm.

Plowing was the most labor intensive of all the farm operations, which accounts for the 11-34 man-animal days or 20.41% of the total labor requirements.

In addition to land preparation, harvesting also required greater labor supply (21.58%) because this was done manually.

On the average, the total labor cost of all farm operations was ₱1,948.96. Among the four labor sources, hired labor contributed the highest cost of ₱996.49/ha or 51.13% followed by operator's labor of ₱673.21 or 34.54%.

Farm Organization

Of the 204 peanut farmers interviewed, 50% were members of farm organization in their respective localities (Table 8).

Table 7. Labor requirements per hectare of the 204 peanut farms, by operation and by source, Philippines, 1985-86

Operation	Source (Mandays)				Total mandays	Percentage
	Operator	Family	Hired	Exchange		
Clearing	2.13	0.30	0.73	–	3.16	5.69
Plowing (2x)[a]	6.50	1.42	3.34	0.08	11.34	20.41
Harrowing (2x)[a]	0.51	0.74	2.16	0.06	3.47	6.24
Harrowing[a]	1.09	0.18	0.89	0.02	2.18	3.92
Planting	1.68	0.76	3.94	0.09	6.47	11.64
Off-barring[a]	0.94	0.10	0.51	0.05	1.60	2.89
Hilling-up[a]	0.13	0.04	0.14	–	0.31	0.56
Weeding	2.24	0.83	5.13	0.20	8.40	15.12
Spraying	0.40	0.05	0.46	0.03	0.94	1.69
Fertilizer application	0.48	0.14	0.18	–	0.18	1.44
Manual cultivation	0.35	0.02	0.83	0.04	1.24	2.23
Harvesting	1.52	1.93	8.19	0.35	11.99	21.58
Drying	0.61	0.55	0.94	0.06	2.16	3.89
Shelling/packing	0.45	0.30	0.74	0.01	1.50	2.70
TOTAL	19.03	7.36	28.18	0.99	55.56	
PERCENT	34.25	13.25	50.72	1.78	100.00	100

[a]Expressed in man-animal days.

Different farm organizations existed in the six provinces studied, such as Samahang Nayon (SN), Farmer's Association (F.A.), National Irrigators Association (NIA), Agrarian Reform Beneficiary Association (ARBA), and Kilusang Kabuhayan for Peanut (KKK-P). Most of the farmers joined Samahang Nayon and Farmer's Association. The list of farm organizations in which some of the farmers were members is shown in Table 9.

Although there exist various farm organizations, only KKK for Peanut in Pangasinan was created mainly for peanut growers; unlike the Samahang Nayon which was created nationwide mainly for rice farmers.

According to majority of the farmers, they have not received any benefits from their respective farm organizations. However, some farmers responded that some farm organizations helped them by providing funds and material inputs needed in their farms, assisting them on agrarian-related problems, providing them with irrigation facilities, and teaching them about cooperation and some technical know-hows in farming. The list of benefits derived from joining these farm organizations as reported by the farmers is presented in Table 10.

Table 8. Membership of 204 peanut farmers in farm organizations, by province, Philippines, 1985-86.

Item	Bataan	Batangas	Bohol	Cagayan	Isabela	Pangasinan	All Provinces
Number of farmers belonging to farm organization(s)	20	7	22	6	12	37	109
Number of farmers who don't belong to any farm organizations	12	9	7	12	37	23	108

Table 9. Number of peanut farmers by type of farm organization and province, Philippines, 1985-86.

Farm Organization	Bataan	Batangas	Bohol	Cagayan	Isabela	Pangasinan	All Province
Samahang Nayon	16	4	11	–	3	17	53
Farmer's Association	4	3	11	6	–	4	26
National Irrigators Association	3	–	4	–	1	–	8
Agrarian Reform Beneficiary Association	–	–	–	–	9	11	20
Kilusang Kabuhayan at Kaunlaran for Peanut Growers		–	–	–	–	4	4

Table 10. The farm organization and the benefits derived by 109 farmers, Philippines, 1985-86.

Farm Organization/Benefit Received by Farmers	Number Reporting
Samahang Nayon	
Fertilizer loan/credit assistance	22
Technology transfer through seminar/trainings	6
Cooperative profit sharing	1
Discussion of problems and formulation of solutions	1
Cooperation of farmers towards common goal	1
Facilitate land transfer	1
None	25
Agrarian Reform Beneficiary Association	
Additional knowledge on peanut production	4
Credit assistance	3
Land protection	4
Assistance in agrarian-related problems	3
Enhancement of cooperation among fellow farmers	2
None	14
Farmers Association	
Additional information on training	2
Credit assistance in terms of loans, animals, and material inputs	3
Enhancement of greater cooperation among farmers	1
None	14
National Irrigators Association	
Provision of irrigation facilities	3
Kaunlaran Kabuhayan sa Kaunlaran for peanut	
Credit assistance	1

*Some farmers reported more than one benefit.

Credit and Financing

Although there were lending institutions present in the study areas, majority of the farmers (61.77%) reported that they were not able to secure loans from these institutions. The common complaint of the farmers regarding access to formal credit were as follows: (1) high interest rates; (2) the amount of paper work involved; and (3) limited credit facilities.

However, there were some farmers (38.23%) who were able to secure loans from the different lending institutions, such as banks, government agencies, and private lenders. The banks were usually agricultural which provided loans to the farmers. The government agencies, on the other hand, were government agencies like Philippine Coconut Authority and Kilusan Kaunlaran sa Kabuhayan which have programs to help the farmers through loan assistance. The private lenders include trader, landlord, relatives, and friends. The sources of loans according to the farmers interviewed are shown in Table 11.

About 47% of the farmers borrowed money from the bank to finance their peanut farms. Majority of these farmers secured loan from Rural Bank because it offered the lowest interest rate of 15% per cropping season. However, a considerable number of farmers also borrowed money from private lenders (46.15%), despite the relatively higher interest rates (about 30-40%/cropping season), since it is easier to loan money as well as the immediate encashment. The government agencies which provided loans to the farmers (PCA and KKK) were only present on certain provinces. These

Table 11. Sources of loan among 78% peanut farms in the six provinces studied, Philippines, 1985-86.

Source of Loan	Number Reporting	Percentage
Banks		
Rural Bank	25	47.43
Development Bank of the Philippines	6	32.05
Philippine National Bank	5	7.69
Village Savings Bank	1	6.41
Government Agencies		1.28
Kilusan Kaunlaran at Kabuhayan	4	6.41
Philippine Coconut Authority	1	5.13
Private Lenders		1.28
Trader	20	46.15
Landlord, Friends and Relatives	16	25.64
		20.51
Total	78	100

agencies also offer small amount of loan to the farmers ranging from ₱1,000 to ₱2,000/person per cropping season.

The farmers reported that the money they loaned was used to procure material inputs (seeds, fertilizer, chemicals, and draft animals) needed in peanut farming. However, some farmers reported that they have used the borrowed money for the other purpose, such as hospitalization, schooling, political campaign, and even marriage of son. The average amount the 78 farmers loaned was ₱4,225.95. Majority of the farmers who borrowed money from the different sources reported that the money was not sufficient (Table 12).

Table 12. Credit sufficiency according to 78 peanut farmers in six selected provinces, Philippines, 1985-86.

Credit Sufficiency	Number Reporting	Percentage
Sufficient	28	37.90
Not sufficient	41	52.56
No response	9	11.54
Total	78	100.00

Extension Services

Forty percent of all the peanut farmers interviewed revealed that they did not receive any technical help from anyone. However, several farmers cited that their main sources of technical assistance came from the extension workers/technicians (31.37%), input suppliers (13.24%), land owners (9.31%), relatives/neighbors (2.94%), and fellow farmers (2.94%). The sources of technical assistance are shown in Table 13.

According to the farmers, the technical assistance they received from government extension workers/technicians were in the form of free seminars/training regarding new ways of farming, free consultation on pest and disease prevention, and crop protection. However, these seminars/training dealt mainly on the new and better ways of producing priority crops, such as rice and corn.

Table 13. Sources of technical assistance of the 204 peanut farmers in the Philippines, 1985-86.

Source of Technical Assistance	Number Reporting	Percentage
Government extension workers/technicians	64	31.37
Relatives/neighbors	6	2.94
Land owners	19	9.31
Fellow farmers	6	2.94
Input suppliers	27	13.24
None	82	40.20
Total	204	100.00

Production and Disposal

The average production of peanut was 945.10 kg/ha or 884.89 kg/ farm. This implies that, on the average, a single farmer was able to produce only 0.88 mt with an average farm size of 0.94 ha. The volume produced by farmers is usually divided into operator's share, landlord's share, and harvester's share.

The operator's share include the volume sold, peanuts for home use, seeds, paid to creditor, and give aways. For the share-tenants, the landlord's share, on the average, comprised about one-third to one-fourth of the total production. The payments of the harvesters were usually derived by taking one-tenth of the total production. The production and disposal of peanut in 204 farms is shown in Table 14.

Marketing of Peanuts

The peanut farmers sold their produce to traders, assemblers, wholesalers, or wholesaler-retailers (Table 15). Traders usually function as middlemen, who visit the farms during harvesting pe- buyers usually set their buying price, and both the farmers and the traders agree on a price. Some traders even buy the crop ready to be harvested and take charge of the harvesting.

Table 14. Production and disposal of peanut in 204 farms, Philippines, 1985-86.

	All Provinces	Average Per Hectare (kg)	Quantity[a] Per Farm (kg)
Operator's share	159,966.88	758.86	710.50
Volume sold	144,942.28	58.03	52.80
Seeds	9,833.05	163.77	114.34
Give away	1,254.80	52.83	52.28
Paid to creditor	188.00	48.21	37.60
Landlord's share	13,977.17	312.02	212.08
Harvester's share	6,553.05	158.75	144.96

[a]Computed in terms of the number of respondents reporting.

Table 15. Different outlets and the mode of sale for peanut according to 20 peanut farmers, Philippppines, 1985-86.

Outlet	Mode of Sale[a] Picked-up	Delivered	Total	Percentage
Trader	49	9	58	28.43
Assembler-wholesaler	36	13	49	24.02
Wholesaler	13	37	50	24.51
Wholesaler-retailer	18	28	47	23.04
Total	116 (56.86%)	88 (43.14%)	204	100.00

*Data represent number of farmers.

Majority of the farmers also preferred that their produce be picked-up by the buyer since transporting of the produce is taken care of by the buyer. However, some farmers still chose to transport their produce to look for other outlets that could provide a more favorable price.

The average farm price for a kilogram of unshelled peanut was ₱7.90, which was still very low compared to the average retail price for unshelled peanuts at ₱ 12.62 (National Food Authority).

The farmers also reported that they encountered marketing-related problems (Table 16), namely, the buyer set the price of peanut which was usually very low; lack of market information; lack of steady market; and problem on transporting the produce to the market. The low price set by the buyers greatly affected the profitability level of the crop since low price generated low total revenue.

Table 16. Marketing-related problems reported by 204 peanut farmers, Philipines, 1985-86.

Problem[a]	Number Reporting	Percentage
Low price of peanut	141	46.84
No steady market	29	9.63
Lack of market information	19	6.31
Transportation problem	6	2.00
Controlled price by buyers	59	19.60
No problem	18	5.98
No response	29	9.63
Total	301	100.00

[a]Some farmers reported more than one marketing-related problem.

Technical Efficiency Analysis

The mean technical efficiency was calculated to determine whether total output can be increased if farmers were encouraged to use the best practice. The mean technical efficiency of the farms was measured by taking the ratio of actual output of the individual peanut farms to the best practice or potential output. The potential output of 2,000 kg/ha was based from *The Philippines Recommends for Peanut* published by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD).

The mean technical efficiency of all individual farms from the selected provinces considered in this study is shown in Table 17. The mean technical efficiency for all provinces was 0.47, which means that the farmers attained 47% of the potential output of 2,000 kg/ha. Comparing the mean technical efficiencies among the farms studied, the peanut farms in Batangas proved to be the most efficient, attaining 82% of the potential output. However, this is nonconclusive due to the uneven samples attained from each province.

Table 17. Technical efficiencies of the peanut farms among the selected provinces, Philippines.

Province	Number Reporting	Total Area (ha)	Production		Technical Efficiency
			Total	Per Hectare	
Bataan	32	29.48	39,740	1,348.03	0.67
Batangas	16	6.62	10,845	1,638.22	0.82
Bohol	29	13.31	13,975	1,049.96	0.52
Cagayan	18	19.75	14,541	736.25	0.37
Isabela	49	62.55	46,492	743.28	0.37
Pangasinan	60	59.29	54,924	926.36	0.46
All Provinces	204	191.00	180,517	945.12	0.47

Cost-and-Return Analysis

The cost and return analysis measures the success or failure of the farm business. This section deals mainly on the profitability of peanut production using cost and return analysis (Table 18).

Farm Receipts

Total farm receipts include the value of the product sold in cash and the noncash value of farm privileges of crops consumed and given away.

Cash receipts, on the average, was valued at ₱6,690.36/ha and ₱5,327.74/farm. Noncash receipts include the value of peanut seeds produced and used in the farm, seeds used at home, payment to creditor, peanut given away, and landlord's and harvester's share. Total farm receipts amounted to ₱13,469.50/ha or ₱10,127.20/farm.

Table 18. Production costs and returns from 204 peanut farms, Philippines, 1985-86.

Item	Total	Per Hectare	Per Farm
Total farm size (ha)	191.00	–	–
Average farm size (ha)	–	–	0.94
Yield (kg)	180,517.10	945.12	824.29
Cash Receipts (₱)			
Sales from peanut	1,086,858.72	5,690.36	5,327.74
Noncash Receipts			
Value of landlord's share	109,692.28	2,445.21	1,662.00
Value of harvester's share	57,349.38	2,657.27	1,006.13
Value of peanut paid to creditor	2,210.00	566.67	442.00
Value of peanut given away	9,811.18	413.10	408.79
Value of peanut consumed at home	29,327.45	453.98	413.06
Value of peanut stored for seed purposes	74,629.30	1,242.99	867.78
Total noncash receipts	233,019.59	7,779.22	4,799.46
Total Receipts	1,369,878.31	13,469.58	10,127.20
Cash costs (₱)			
Seeds	134,020.00	1,098.96	1,023.37
Fertilizers	16,050.00	381.31	371.50
Chemicals	2,350.00	240.30	195.90
Hired labor	372,251.36	1,948.96	1,824.76
Land rent	4,665.67	311.04	285.56
Land tax	9,174.75	101.99	88.22
Interest on loan	30,700.35	400.00	393.59
Food Expenses	8,650.00	127.76	115.86
Hauling/transportation expenses	4,270.70	100.00	96.47
Irrigation fee	2,050.00	150.67	136.67
Total Cash Cost	584,182.83	4,860.99	4,531.90
Noncash Costs			
Value of unpaid operator's labor	128,581.86	673.20	671.32
Value of unpaid family labor	47,040.75	246.29	230.59
Value of landlord's share	109,692.28	2,445.21	1,662.00
Value of harvester's share	57,349.38	2,657.27	1,006.13
Value of seeds stored for seed purposes	74,629.30	1,242.99	867.78

Table 18. Continued.

Item	Total	Per Hectare	Per Farm
Value of peanut given away	9,811.18	413.10	408.79
Value of peanut paid to creditor	2,210.00	556.67	442.00
Depreciation	1,485.45	77.76	72.96
Interest on operating capital	80,771.48	337.02	294.80
Total Noncash Costs	511,571.68	8,649.51	5,611.37
Total Costs	₱1,095,754.51	₱13,510.50	₱10,143.27
Net Cash Income	502.675.89	829.37	795.84
Net Total Income & Loss	274,123.80	(40.92)	(16.07)

Farm Costs

In this study, costs were classified either as cash or noncash. Cash costs include seeds, fertilizers, chemicals, hired labor, land rent, land tax, loan interest, food expenses, hauling/transportation fee, and irrigation fee. On the average, the total cash cost for all farms was ₱4,860.99/ha or ₱4,531.90/farm. Pumps for irrigation were rented. On the average, the irrigation pumps were rented for ₱150.67/ha or ₱136.67/farm. The land tax was valued at 1% of the assessed land value. The interest rate on loan was computed based on the interest rate agreed upon by the farmer and the lender, which vary from 10-30%/cropping period.

On the other hand, noncash costs include operator's labor, unpaid family labor, landlord's share, harvester's share, seed produced which will be used in the farm, peanuts given away, payment to creditor, depreciation, opportunity cost, and operating capital. The interest rate on operating capital was 20%/year and was adjusted based on the number of months spent on peanut production. The value of the operator's labor was either ₱20-50/mandays or ₱60/MD for different labor operations which were the actual wages in the study areas. The depreciation cost was computed using the straight line method. The total noncash costs, on the average, was ₱8,649.51/ha or ₱5,611.37/farm. The total costs (cash and noncash) amounted to ₱13,510.50/ha and ₱10,143.27/farm (Table 18).

Farm Income

The income of the farmer cooperators is shown in Table 18. The net income was valued only at ₱829.37/ha or ₱795.84/farm. However, when noncash costs were considered, there was a net noncash loss of ₱870.29/ha and ₱811.91/farm. A total net loss of ₱40.92/ha or ₱16.07/farm were incurred; although the farmers were still not on the losing end because they were able to adequately cover the cash costs.

Constraints in Peanut Production

The crop's profitability is one of the factors the farmers consider in their choice of the crop to plant. Another consideration is the identification of the factors that pose as constraints in the productivity level of their chosen crop.

It is important to identify the limiting factors or constraints to higher yields of peanut at the farm and to determine the possible solutions to these constraints. Overcoming them would mean an increase in the production efficiency of the farmer and consequently improve their quality of life.

This part deals with the constraint analysis of higher yield. To identify the physical factors influencing/inhibiting peanut yield, a regression analysis was run using production and the different inputs.

Production Estimates

Production function analysis identified the different inputs that significantly influence yield. The inclusion of some socioeconomic variables in the production function clarified further the constraints to high peanut yields. The standardized regression function showed the relative contribution of the quality of inputs used and the socioeconomic factors to variation in yield. Input coefficient which can be obtained from production function analysis could also provide insights in the determination of the optimum level of input utilization.

The estimated coefficients of the regression equation indicate the percentage change in farm input production due to a 1% increase in one input holding all other inputs constant. The coefficients of elasticities obtained in both models were all positive and less than one, except for the regression coefficient of the dummy variable on irrigation which was negative.

A positive but less than one coefficient of elasticity indicates the diminishing marginal returns with respect to a given input.

This means that peanut production in the peanut farms studied increases by less than 1% when that particular input is increased by 1%. Also, positive coefficients can be interpreted in such a way that increase in peanut output can be achieved by increasing the intensity of input use.

The production function for peanut was estimated using per farm data. In the regression equation, the estimate contained five quantitative and dummy variables; only three of the variables were significant.

The coefficient of determination (R^2) of the production function was 0.4809, which means that 48.09% of the variation in the farm output was explained by the variables included in the study (Table 19).

The study revealed that there were three factors affecting peanut production, namely: operating capital, total labor, and irrigation. The bulk of operating capital consisted of the value of hired labor and the value of seeds, while the total labor represented the labor for crop care and management. These two factors (operating capital and total mandays) were significant since if all other inputs in peanut production remain at the same level, a percentage increase in the operating capital would increase the output's gross value by 0.24%, while a percentage increase in the total labor would in turn increase the output's gross value by 0.34%.

However, although rainfall is considered as one of the important factors affecting grain legume, results of the study revealed that the dummy on pump irrigation was negatively significant, such that the use of irrigation pump in supplying water for peanut production decreased the gross value of output by 0.004%. This can be explained by the nature of peanut, a relatively drought-tolerant crop. In most instances, the residual moisture from the wet season is enough to support the vegetative and reproductive processes of the crop. Supplemental irrigation is only necessary for the late dry season planting in February. Morever, when irrigation is applied, proper drainage should be considered since poor drainage may cause some portions of the roots and the developing pod to rot and decay, thereby decreasing the chance of attaining higher pod production.

In the regression equation, it was found that application of chemicals and fertilizers has no significance in production since in this study, all of the farmers interviewed used the traditional peanut variety in planting. The traditional variety does not respond well to the application of fertilizer. The farmers also report-

Table 19. Regression coefficient of peanut production using gross value of output per farm as dependent variable, 204 peanut farms in the Philippines, 1985-86.

Variables	Regression Coefficient
Constants (a)	5.3197
	(11.060)
X_1 Farm size	0.1495
	(0.853)
X_2 total labor	0.3448*
	(4.676)
X_3 operating capital	0.238*
	(3.842)
X_4 irrigation	-0.0042*
	(3.735)
X_5 Fertilizer & chemicals	
X_6 chemicals	0.0234
	(0.559)
X_7 fertilizer	-0.0146
	(0.637)
Coefficient of determination R^2	0.4809
Standard Error of Y	0.4810

*Significant at 5% level; values in parenthesis are t-values.

ed that often, application of fertilizer only increase the vegetative growth of the plant, but does not substantially increase yield.

Another production function of peanut was estimated using the per farm data. This time, the total production per farm was considered as the dependent variable and the same independent variables as in the previous regression were used. However, some socioeconomic factors such as age, years in school, years in farming, and years in peanut farming were also included as additional independent variable (Table 20).

The coefficient of determination was 0.7166, which means that 71.66% of the variation in the farm production was explained by the variables included. Only three independent variables were found to have significant influence on the total production per farm. These were farm size, operating capital, and irrigation.

The marginal physical product and marginal value product were also derived (Table 21). Based on the results, an additional increase in the hectarage would increase total peanut production by

Table 20. Regression coefficient of peanut production using total production per farm as different variable, 204 peanut farms, Philippines, 1985-86.

Variable	Regression Coefficient
Constants	2.1050
	(2.742)
X_1 Farm size	0.7093*
	(5.285)
X_2 Total labor	0.3479
	(0.632)
X_3 Operating capital	0.3562*
	(7.583)
X_4 Irrigation	-0.0078*
	(7.924)
X_6 Chemicals	0.5872
	(1.898)
X_7 Fertilizer	0.0014
	(0.080)
Z_1 Age	0.2223
Z_2 Years in school	0.1062
	(1.598)
Z_3 Years in farming	0.0676
	(0.906)
Z_4 Years in peanut farming	-0.0491
	(0.880)
Coefficient of determination R^2	0.7166

*Significant at 5% level; values in parenthesis are t-values.

742.10 kg, while an additional peso increase in operating capital would increase the total peanut production by 0.11 kg. These were the only two factors which significantly affected total peanut production.

The marginal value product (MVP) was computed by multiplying the marginal physical product (MPP) values with the computed price (₱7.89779) of each equation. A unit increase in the use of input will bring a corresponding increase in the value of production. An increase in area planted to peanut can bring about an increase of ₱5,860.97 in value of production; and a unit use of capital will bring about a ₱0.88 increase in value of production (Table 21).

Allocative Efficiency

Allocative efficiency of the different factor inputs were calculated to determine whether the present factor inputs, such as chemicals, fertilizers, and labor were underutilized or overutilized. Under the assumption of perfect competition, there is an efficiency in resources allocation when the marginal value product (MVP) of each input is equal to its marginal factor cost or per unit cost of input. If the marginal value product is greater than the marginal cost, then the use of that particular input should be increased; if otherwise, then the use of that input should be reduced.

The MVPs from the production function were computed using geometric means so that the marginal products would not appear to be biased.

It appears that there is misallocation of farm inputs among all peanut farms (Table 21). The marginal values of fertilizer and chemical inputs were less than their marginal factor cost, which means that farmers who applied fertilizers and chemicals in their peanut farms should reduce their usage by some amount to be more profitable.

Table 21. Marginal physical product, marginal value product, and marginal factor cost.

	Marginal Physical Product	Marginal Value Product (MVP)[a]
Land	742.10280	5860.97215
Operating Capital	0.11146	0.88424
Chemicals	3.98826	31.49844
Fertilizers	0.00386	0.03049
Labor	5.26212	41.55915
	Marginal Factor Cost (MFC)	**MVP/MFC Ratio**
Chemicals	240.00	0.13
Fertilizers	381.31	0.00008
Labor	35.07	1.185

[a]Computed price of a kilogram of peanut = ₱7.89779.

The MVP of labor (41.56) is higher than its MFC (35.07), which implies that the present utilization of labor may be at its optimum level.

Yield Constraint According to the Farmers

This portion deals with the factors which, according to the farmers, have contributed to their farms' low yield performance. They cited the physical and agroclimatic factors, such as occurrence of typhoon and dryspell, infestation of pests and diseases, and poor soil condition which contributed to the low yield of their peanut farms.

They also reported that some factors, such as the use of poor quality seeds, limited operating capital, increasing cost of material inputs, and lack of technical know-how on peanut production pose as constraints in achieving the potential yield of the crop.

The factors constraining high peanut yield according to 204 peanut farmers is shown in Table 22.

Table 22. Factors constraining high peanut yield according to 204 peanut farmers, Philippines, 1985-86.[a]

Factors	Number of Farmers Reporting	Percentage
Occurrence of typhoon/drought	70	17.20
Pest and disease infestation	47	11.55
Poor quality seeds used in planting	28	6.88
Unavailability of seed materials	8	1.97
Yearly decrease in yield	38	9.34
Lack of operating capital	75	18.42
Lack of technical know-how on peanut production	66	16.22
Limited area cultivated for peanut production	4	0.98
Lack of irrigation facilities	12	2.95
Poor soil condition	15	3.69
Negligence in managing their farms	3	0.74
No response	20	4.10
Total	407	100.00

[a]Some farmers cited more than one factor.

Summary and Conclusion

Peanut has always been consumed as food, feed or for industrial purposes due to its relatively high protein and oil content.

Despite the various uses and high demand for peanut and its adaptability to Philippine climate, the full exploitation of peanut as a commercial crop has not been fully realized in the country. The national yield level of peanut has always been below 1 t/ha, which is often attributed to lack of appropriate technology and use of low-yielding and pest-susceptible varieties.

Efforts had been made to increase local peanut production. In the early part of 1980s, the government, in its effort to increase domestic peanut production, launched the National Research and Development Program. Despite this effort, the peanut production in the country still remained to be low.

With the goal of promoting domestic production of peanuts, proper technology is necessary to achieve level of productivity. In agricultural production, the adaptability and adoption of technology package do not only depend in attaining the highest yield, but also whether or not it gives high net returns.

In the development of the peanut industry, not only the technical aspect (agro-climatic) of peanut should be assessed, but equally important is the evaluation of socioeconomic factors that pose as constraints in the productivity level of the crop. Thus, this is aimed at looking at factors that affect both the productivity and profitability of the crop.

The study made use of primary data through actual interviews of 204 peanut farmers from Ilocos, Cagayan Valley, Central Luzon, Southern Tagalog, and Central Visayas regions. These regions were represented by the provinces of Pangasinan, Cagayan and Isabela, Batangas, Bataan, and Bohol.

On the average, peanut farmers attained 5.5 years of schooling and 14.0 years of peanut farming. Majority of the farmers were owner-operators.

Although the average farm area for all farms studied was 2.24 ha, the area devoted to peanut farming averages 0.94 ha only. Almost all of these farms are located in flat areas, and majority depended on rain as the main source of water for irrigation.

It is evident that the traditional variety is still the popular variety used in planting as reported by all farmers interviewed.

Peanut, despite of being a relatively short duration crop, has never been considered as a major cash crop but only as a single crop after rice, intercrop of corn and alternative crop for sweet potato, mungo, sorghum, or watermelon.

Peanut production was found to be labor intensive as well as capital intensive. Among the farm operations, land preparation and harvesting were found the most labor intensive.

Of all the major sources of labor, it was found that hired labor and operator's labor were the most utilized in terms of farm labor requirements. The average labor cost for all operations amounted to ₱1,948.96/ha for all 204 farms.

Fertilization and chemical application is not a common practice by the farmers. Only 15% of the farmers applied fertilizers and 7.35% of the respondent applied chemicals to eliminate pests and diseases. The reasons given for not applying fertilizers and chemicals were: high cost of fertilizers and chemicals, and unfamiliarity with the proper supplemental inputs, as well as how to apply them properly. Some farmers even reported that fertilizer application only increased the vegetative part of the crop without the substantial increase in the pod production.

Despite of the presence of various farm organizations which existed in the study areas, only the Kilusan sa Kaunlaran for peanut was created mainly for peanut growers. However, this farm organization was present only in Pangasinan, unlike the Samahang Nayon which is nationwide.

Regarding technical assistance, about 40% of the respondents revealed that they did not receive any technical assistance from anyone. However, several farmers cited that their main source of technical assistance came from extension workers/technicians, input suppliers and land owners.

Formal credit can be secured from banks, government agencies, and private lenders. A considerable number of farmers still preferred borrowing money from private lenders (traders, landlord, relatives, and friends) despite the higher interest rate mainly

because it was easy for them to obtain the loan as well as immediate encashment. Many farmers also chose to avail loan from Rural Banks because it offered the lowest interest rate.

Inspite of the presence of various lending institutions in the study areas, a large number of farmers still reported that they were not able to avail loans from them. The common complaint of the farmers regarding formal credit were as follows: 1) high interest rate; 2) the amount of paper work involved; and 3) limited credit facilities.

On the production aspect, the average peanut production amounted to 945.12 kg/ha or 884.84 kg/farm, indicating a low yield performance. From these figures, the mean technical efficiency of the farms were derived. Using the potential output of 2,000 kg/ha, results showed that the mean technical efficiency for all provinces was 0.47, which means the farmers were able to attain only 47% of the potential output.

The greatest bulk of produce was sold either to traders, assembler-wholesalers or wholesaler-retailers, which ever offered the most favorable price. Average value of sales amounted to ₱5,690.36/ha and ₱5,327.74/farm. Average farm price was ₱7.89/kg.

Total cash receipts, (sales from peanut), and noncash receipts (produce for home use, given away, paid to creditors, seeds, landlord's and harvester's share) amounted to ₱13,469.58 or ₱10,127.50. Noncash receipts amounted to ₱7,779.32/ha or ₱4,799.76/farm. Costs were also computed amounting to ₱13,510.50/ha or ₱10,143.27/farm. These comprised the cash costs and noncash costs which averaged ₱4,860.99/ha or ₱4,531.90/farm and ₱8,649.51/ha or ₱5,611.37/farm, respectively.

Profitability from peanut production based on the results of the costs and returns analysis revealed that returns above cash costs and noncash costs which averaged P4,860.99/ha or losses were incurred from the farm where non-cash costs were considered. Despite such results, peanut farmers were not on the losing end because cash cost were adequately covered by cash receipts.

In order to measure the constraints to peanut production, the regression equation used was:

$Y = f(X_1, X_2, X_3 \ldots X_n, Z_1, Z_2, Z_3 \ldots Z_n U)$ where Y is the gross volume of peanut yield (in P/kg) per farm; X's are the physical factors (farm size, total labor, total operating capital, fertilizer, and chemical expenditures); and Z's are the socioeco-

nomic factors (age of farmer, experience in farming and peanut farming, and educational attainment). The Cobb-Douglas production function was also used.

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln Z_1 + b_9 \ln Z_2 + b_{10} \ln Z_3 + b_{11} \ln Z_4$$

The findings showed that operating capital, farm size, and total labor were the three significant factors affecting peanut production. The dummy variable on irrigation pump was also negatively significant. Being drought-tolerant, the crop can thrive well during the dry season.

On the other production function estimate, only three independent variables, i.e., farm size, operating capital, and irrigation were found to have significant influence to total farm production. The coefficient of determination (R^2) is 72%.

From the regression equation, the marginal physical product and marginal value product were derived. The marginal value product were computed by multiplying the marginal physical product values with the computed price (7.89779) of each equation.

The allocative efficiency of the different factor inputs were calculated to determine whether these inputs were underutilized or overutilized. Results showed that there was misallocation of farm inputs among peanut farmers.

The marginal value of fertilizer and chemical inputs were less than their marginal factor cost which means that for those who applied fertilizer and chemicals in their peanut farms, the use of these inputs should be reduced by some amount to be more profitable.

The MVP of labor was greater than its MFC which implies that the present utilization of labor may be at its optimum level.

The farmers were also asked regarding the factors which contributed to the low yield performance of their peanut farms. The factors that affected the productivity level of their farms were: occurrence of typhoon, or dry spell, pests infestation, unavailability of seeds; the use of poor quality seeds, and the poor soil condition which lead to yield decrease.

They also cited other factors such as limited operating capital coupled with increasing cost of material inputs, lack of technical know-how on peanut production as the major constraint to higher yields and the probable reasons why actual yields are much lower than what are technically feasible.

Recommendations

The study revealed the effect of the interrelationship of the technical and socioeconomic factors which attributed to the basic constraints of peanut production in the study areas.

The technical factors include: the variety used, irrigation, fertilizer, chemicals used, cropping patterns, and cultural and management practices. On the other hand, availability of credit, extension services, prices of input and output, and farm to market roads were among the socioeconomic variables affecting peanut production.

The study further showed that these identified constraints in peanut production brought low income to the farmers due to very low yield, low output price but higher cost of production.

Issues that should be resolved by the government are in terms of providing technical extension service to the farmers. Education is one of the factors which affect the adoption of modern farm technology in the most feasible way. The farmers can acquire it through the extension services rendered by the government. This can be done by transferring the technology from research and demonstration farms to agricultural extension technicians and from technicians to the farmers.

This would be more relevant by giving socioeconomic assessment and evaluation of a technology a priority in government programs to provide feedback mechanism on the impact of the development and use of such technology.

Credit availability was effective in the farmer's decision to adopt the modern technology for peanut. Loans should be made available in time of the farmers' needs. A program of financing similar to other crops should be applied also to peanut production.

And lastly, the efficiency in the allocation of different levels of input like chemical fertilizer, the use of high quality seeds and other farm resources should be properly assessed in order to bring about an economic impact to the farmers.

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Appendices

Appendix Table 1. Peanut production, area harvested and yield, Philippines, Crop Year 1969-70 to 1986.

Crop Year (June-July)	Production (mt)	Area Harvested ('000 ha)	Yield (mt/ha)
1969-70	17.4	32.4	.38
1970-71	18.9	32.5	.41
1971-72	19.0	32.8	.58
1972-73	18.2	33.2	.55
1973-74	21.6	36.7	.59
1974-75	36.2	54.8	.66
1975-76	40.8	60.6	.67
1976-77	46.2	62.7	.74
1977-78	37.8	47.9	.79
1978-79	49.2	53.8	.91
1979-80	49.9	55.1	.90
1980-81	49.6	38.7	.90
1981-82	48.4	56.5	.86
1982-83	35.9	47.8	.75
1983-84	42.3	45.9	.92
1985*	45.2	50.2	.90
1986*	43.9	49.9	.88

Source: Statistical Handbook in Agriculture, Policy Analysis Staff
*Bureau of Agricultural Economics.

Appendix Table 2. Peanuts (Shelled): Supply and Use, Philippines, 1969/70-1983/84.

Crop Year (July-June)	Production[a]	Imports[b] ('1000)	Total Supply (mt)	Exports[b]	Domestic Use			
					Seed[c]	Food Waste[d]	Food Use Total	Food Use Per Capita (kg)
1969-70	12.26	0.01	12.27	–	1.95	0.01	10.31	0.28
1970-71	13.29	0.30	13.29	0.01	1.95	0.30	11.33	0.30
1971-72	13.35	–	13.35	0.01	1.97	–	11.37	0.30
1972-73	12.85	.89	13.74	–	2.00	0.89	10.85	0.27
1973-74	15.21	8.30	23.51	–	2.20	8.30	13.01	0.32
1974-75	25.49	8.31	33.80	0.04	3.29	8.31	22.16	0.53
1975-76	28.78	8.00	36.78	–	3.64	8.00	25.14	0.59
1976-77	32.54	10.77	43.31	0.02	3.76	10.77	28.76	0.65
1977-78	26.60	9.71	36.31	0.15	2.87	9.71	23.58	0.52
1978-79	34.70	29.14	63.84	–	3.23	29.14	31.47	0.68
1979-80	35.15	12.97	48.12	0.02	3.31	12.97	31.82	0.67
1980-81	20.86	–	20.86	–	2.32	–	18.54	0.38
1981-82	34.27	2.44	36.71	–	3.39	2.44	30.88	0.61
1982-83	25.31	–	25.31	–	2.87	–	24.44	0.44
1983-84	29.80	0.10	29.90	–	2.76	–	27.14	0.51

(—) Data not available.;

[a] Shelled;

[b] Peanuts and peanut meal in peanut equivalent;

[c] Based on seeding rate of 60;

[d] Imported oil cake and meal equivalent to peanuts.

Source: Statistical Handbook in Agriculture, Policy Analysis Staff, MAF based on data from BAEcon, SSD and NCSO.

Appendix Table 3. Varieties of peanut, yield/hectare and shelling percentage.

Variety	Yield/Hectare (mt)	Shelling Percentage
E.G. Bunch for dry season	4.4	73.54
BPI-15	2.8	64.40
BPI-82	2.7	57.70
BPI-24	2.2	67.20
BPI-10	4.9	75.65
E.G. Bunch for wet season	4.1	67.83
BPI-9	3.3	68.68
D'Cream	3.3	70.17
BPI-19	3.1	66.32
CES-101	3.0	57.77

Source: Bureau of Plant Industry.

Appendix Table 4. Peanut production by region, Philippines, 1985.

Region	Production (mt)	%
Cagayan Valley	19,393	42.93
Ilocos	11,102	24.57
Southern Tagalog	3,336	7.38
Central Visayas	2,023	4.48
Central Mindanao	1,919	4.25
Western Mindanao	1,731	3.83
Central Luzon	1,431	3.17
Bicol	1,132	2.51
Western Visayas	919	2.03
Eastern Visayas	843	1.87
Southern Mindanao	760	1.68
Northern Mindanao	587	1.30
Philippines	45,175	100.00

Source: Bureau of Agricultural Economics.

Appendix Table 5. Retail prices of unshelled and shelled peanuts, Philippines 1978-85.

Year	Average Price	
	Unshelled	Shelled
1978	3.32	6.61
1979	4.38	8.41
1980	4.76	9.09
1981	5.99	10.64
1982	6.58	11.77
1983	7.17	11.97
1984	10.74	18.49
1985	12.62	22.00

Source: National Food Authority.

Appendix Table 6. Percentage contribution of field legumes to total agriculture by area, quantity and value of production, Philippines, 1985.

Item	1985	Percentage
Total agriculture		
Area ('000 ha)	11,865,487	100
Quantity ('000 mt)	27,093,154	100
Value ('000 ₱)	81,545,640	100
Soybeans		
Area	8,430	0.07
Quantity	8,479	0.03
Value	61,128	0.07
Peanuts		
Area	50,210	0.42
Quantiy	45,175	0.17
Value	383,674	0.47
Mungo		
Area	37,430	0.32
Quantity	26,855	0.10
Value	320,479	0.39
All Field Legumes		
Area	96,070	0.81
Quantity	80,509	0.30
Value	765,281	0.94

Source: Bureau of Agricultural Economics