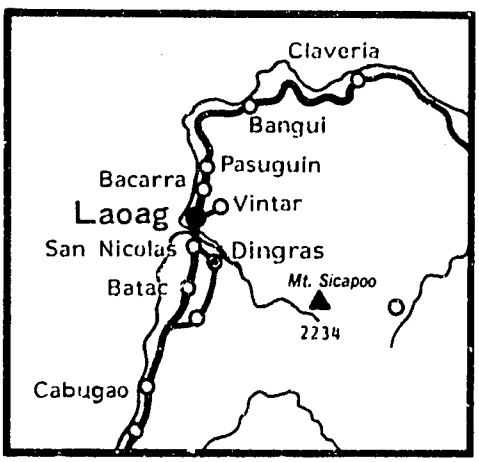
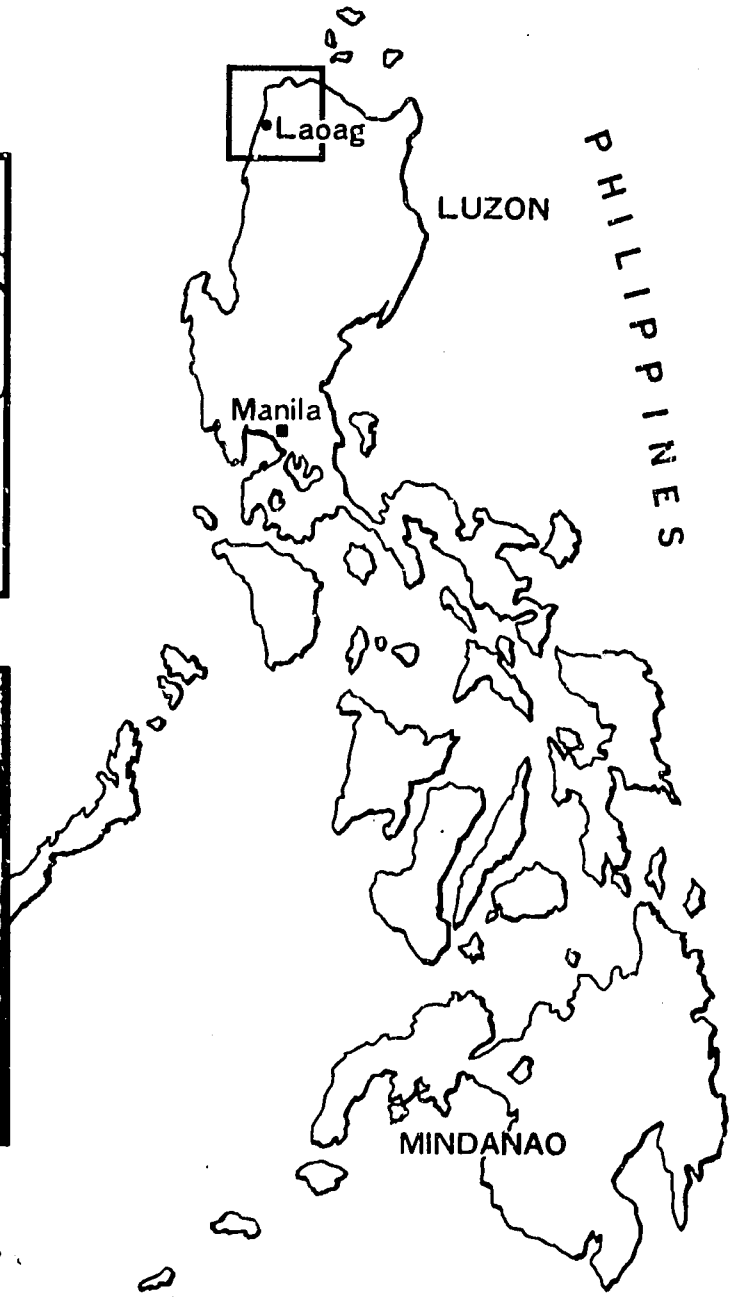
Vegetable Consumption and Production in Two Municipalities in Ilocos Norte, Philippines

John S. Caldwell
Donald W. Newsom





Technical Bulletin No.14
The Asian Vegetable Research and Development Center

The results reported in this publication are taken from a dissertation by the senior author submitted to the Department of Horticulture, Louisiana State University, entitled "In Search of a New Lunes ni Kodas: An Integrated Approach Towards Increased Rainy Season Vegetable Production in Two Municipalities in Ilocos Norte, Philippines." The views expressed are those of the authors and do not necessarily represent those of the Asian Vegetable Research and Development Center.

Correct Citation:

Caldwell, John S. and Donald W. Newsom. 1984. Vegetable Consumption and Production in Two Municipalities in Ilocos Norte, Philippines. Technical Bulletin No. 14. Asian Vegetable Research and Development Center. Shanhua, Taiwan, ROC.

AVRDC Publication 84-203

Vegetable Consumption and Production in Two Municipalities in Ilocos Norte, Philippines

John S. Caldwell
and
Donald W. Newsom

ASIAN VEGETABLE RESEARCH & DEVELOPMENT CENTER
1971

Acknowledgements

The senior author would like to express his thanks to a few of the many people and organizations who provided assistance for this study: Drs. G. W. Selleck and J. C. Moomaw and the staff of the Asian Vegetable Research and Development Center; Dr. E. B. Pantastico and the staff of the Crops Research Division, Philippine Council for Agriculture and Resources Research; Director D. F. Panganiban, Mr. E. P. Gianzon, Mr. M. Varquez, Mrs. A. Bautista, Mr. G. V. Dulig, and the staff of the Philippine Bureau of Plant Industry; Dr. A. Palo and the staff of the AVRDC Philippine Bilateral Project; the Bureaus of Agricultural Extension and Agricultural Economics; the Ministry of Agrarian Reform; Gabu Weather Station, Philippine Atmospheric, Geophysical, and Astronomical Services Administration, Philippine Ministry of Defense; the captains and farmers of the various Barangays in Dingras and Laoag; and the Rockefeller Foundation and Louisiana State University for their financial support.

Vegetable Consumption and Production in Two Municipalities in Ilocos Norte, Philippines

John S. Caldwell and Donald W. Newsom

Introduction

The Asian Vegetable Research and Development Center has made significant progress in breeding vegetable crops that combine high yield potential, improved nutrient content, disease and insect resistance, and tolerance to a wide range of lowland tropical conditions. In addition, AVRDC agricultural economics surveys and crop management research have drawn from the experience of farmers in Taiwan to develop a series of improved crop production techniques. In order to benefit the small farm families of developing countries, however, AVRDC technology needs to be tailored to conditions at the regional, sub-regional, and provincial levels. While the primary responsibility for this task lies with national research and extension systems, AVRDC research also has a role to play in the development of methodology for tailoring technology. Recognizing this role, an AVRDC "Development Program" was established in 1979.

This study is one component of that program. It focuses on vegetable production in the rainy season (May-October) in two municipalities in the province of Ilocos Norte, Philippines, with the objective of integrating surveys of small farm vegetable consumption and production with AVRDC crop management research.

The Farm Household Production-Consumption System

In simplest terms, insufficient vegetable supply during the rainy season (Figure 1-1) can be viewed as a technological problem. First, researchers develop new vegetable cultivars and improved production practices (Figure 1-2) in order to use purchased and non-purchased resources more efficiently. This makes increased vegetable production feasible (Figure 1-3). Increased production, in turn, results in greater supply (Figure 1 returning to 1).

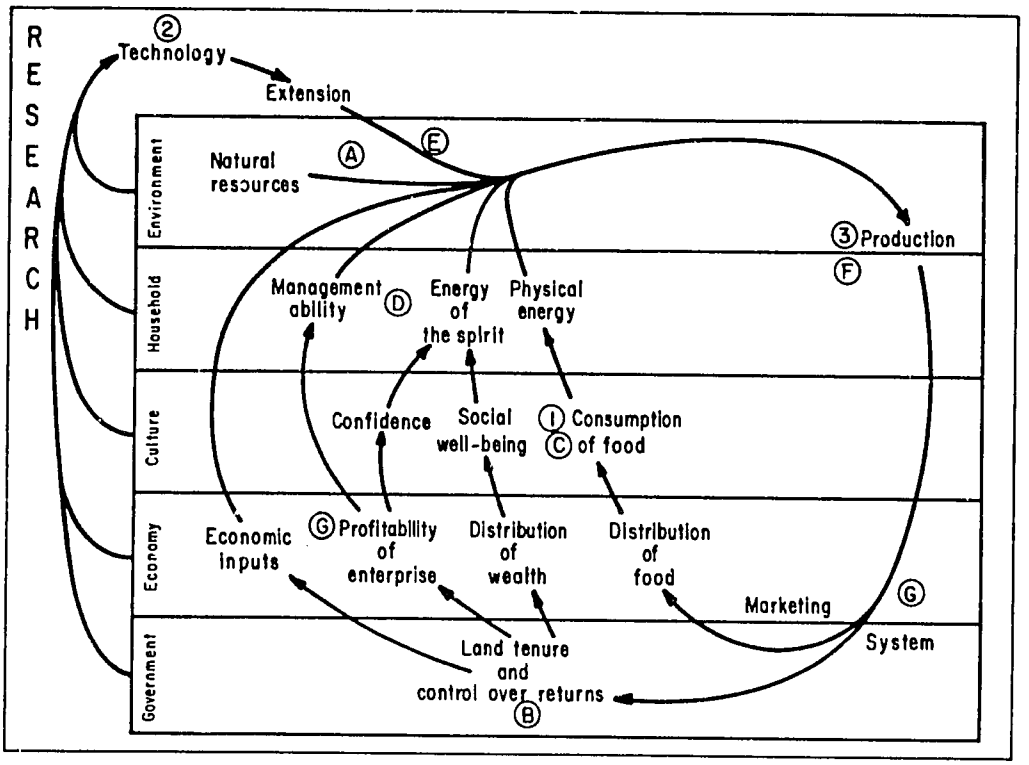


Figure 1. The farm household production-consumption system.

The farm household's objective, however, is not increased production for its own sake, but the betterment of the household's well-being. A farm household will adopt new technology only if its members can understand it and believe it will benefit their well-being. Their understanding of a new technology is based on previous experience, and their perception of how it will benefit them depends on how well the institutional, economic, and socio-cultural environments reward them for using more resources to increase production.

The dynamics of the system can be viewed as follows (Figure 1). Production is the result of the farm household members' application of their own energy and skills, purchased and non-purchased resources, and available technology. Yields from production enter the marketing system, either explicitly through the sale of produce, or implicitly as the value of produce retained by the farm household. The marketing system is a product of natural economic conditions and institutionalized government policy. The marketing system yields economic returns and food.

Food moves through the economic system, both explicitly in the market and implicitly as subsistence food retained by farm households. The result is a pattern of food distribution in the village. Each farm household consumes food in accordance with prevailing customs. Food consumption results in physical energy which farm household members use in productive activities.

Land tenure and control over economic returns are fundamental determinants of the distribution of wealth in the village, the profitability of the farming enterprise, and the ability of the household to purchase inputs for production. An equitable distribution of wealth is essential for the mix of material and intangible goods that the rural culture defines as social well-being. A profitable farming enterprise develops management ability in the farm household and gives household members confidence in themselves.

Confidence and a sense of social well-being, in turn, are essential for what the Japanese term "energy of the spirit" or a "yen to do" (yaru ki). This can also be called receptiveness to change or willingness to innovate. Only farmers who have this "yen to do" will adopt a new technology in order to increase production.

The model shows that the system is cyclical. Not only does well-being depend on management and environmental factors, but management, including the "yen to do," at the same time depends on well-being.

Format of the Study

The approach of this study was that in tailoring technology the entire system must be studied in order to evaluate the potential for adoption by farm households of new rainy season vegetable production technology. Accordingly, data were obtained from different parts of the farming system (Figure 1):

Seasonal Environmental variability (A)
Farmer control over returns from tilled land (B)
Consumption of seven vegetable crops - Tomato, bell pepper, common cabbage, Chinese cabbage, mungbean, soybean, and sweet potato (C)
Attitudes towards and previous experience with production of the above seven vegetable crops (D)
Availability of information on new rice and vegetable production technology (E)
Cropping patterns and crop production practices (F)
Input and product prices and overall farm organization (G)

This report discusses the relative market and subsistence orientation of farm households towards the seven vegetable crops in the area.

Environment

The province of Ilocos Norte is situated along the northeast coast of the island of Luzon. The province has a typical monsoon climate with alternating dry and rainy seasons. A key question for rainy season vegetable production is whether it is possible to prepare the land for planting after the onset of the rains. In

1979, field experiments were conducted at Dingras, Ilocos Norte. Based on conditions at Dingras, a model was constructed for identification of dry periods during which land could be prepared. The model consists of a set of rules for determining the number of days to count as a wet period after a day or period of heavy (>25 mm) rainfall. The rules also specify when to treat two periods of heavy rainfall, broken by one or more day(s) of little or no rainfall, as one period of cumulative heavy rainfall or as two separate periods.

This model was applied to the distribution of daily rainfall at the weather station in Gabu, Laoag City, Ilocos Norte, from 1965 to 1979 (9). Each month from March through December was divided into three 10-day segments (for 30-day months) or two 10-day segments and one 11-day segment (for 31-day months). The following statistics were calculated for each segment:

(1) Mean total rainfall during the 10- (or 11-) day period,
(2) Percentage of dry years with no periods of heavy rainfall or wet conditions during the 10- (or 11-) day period,
(3) Percentage of mixed years with at least one period of heavy rainfall or wet conditions during the 10- (or 11-) day period,
(4) Mean dryness index for mixed years derived by the following formula:

$$MDI = \%DY + \%MY \times \frac{DP}{DS} \text{ (see footnote)}$$

(5) Percentage of wet years in which the entire segment was one of continuous heavy rainfall and/or wet conditions,
(6) Percentage of non-wet years (the sum of the percentages of dry and mixed years, equal to 100 minus the percentage of wet years).

Results of the analysis using this model indicate the times when land preparation is feasible (Figure 2). Farmers can expect little problem in most years if the land is prepared before May 20. Late May and early June are less favorable for land preparation. After the initial wave of heavy rainfall, precipitation decreases markedly during the last part of June, and dry conditions are more frequent from mid-June through mid-July. Thereafter, rainfall increases sharply, and the frequency of dry conditions is lowest during the three periods from July 21 to August 20. After September 10, rainfall decreases significantly and the frequency of dry conditions rises again. In October, conditions again reach mid-June to mid-July levels, and by the end of November conditions have returned to April levels.

MDI = mean dryness index, %DY = percent dry years, % MY = percent mixed years, DP = mean length of dry periods, DS = length of segment.

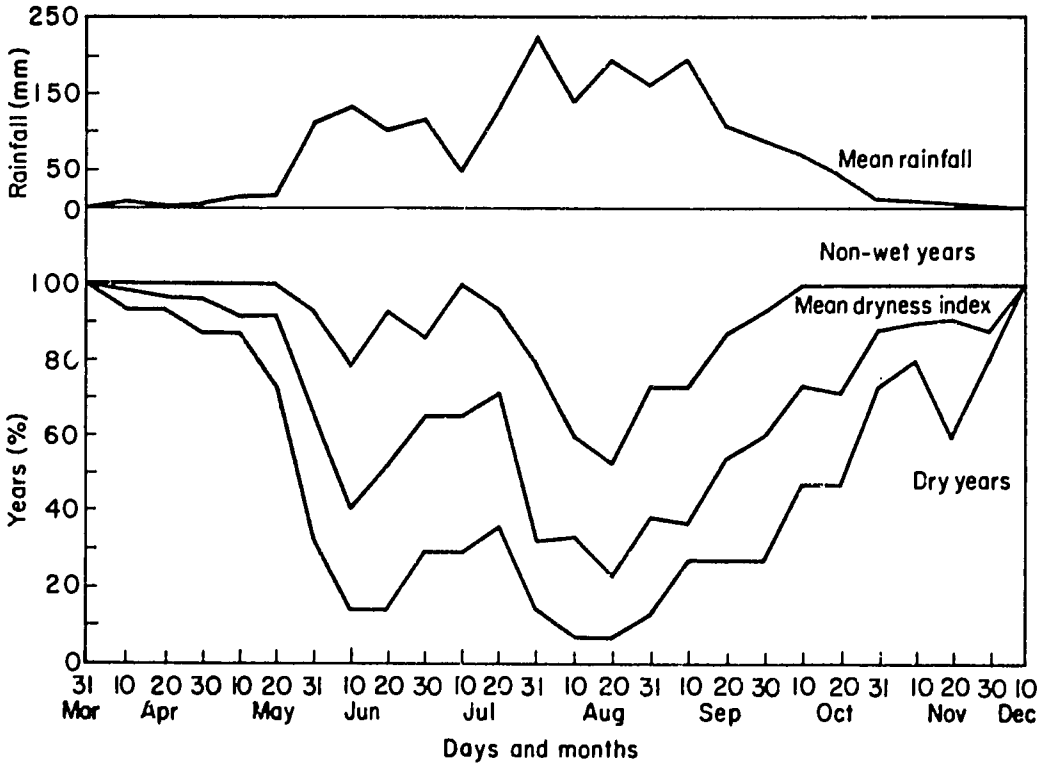


Figure 2. Percentage of dry years, mean dryness index, percentage of non-wet years, and mean rainfall during one-third month segments from March 21 to December 10, 1965-1979.

Survey Procedure

The 1979 population of Ilocos Norte was estimated at 385,000 persons or 71,000 households. Approximately 48,500 households, 69%, are farm households (6). The province is divided into 22 municipalities, plus the provincial capital of Laoag City. The organization of the latter is identical to the other municipalities, so for convenience the term "municipality" will also be used to refer to Laoag. Each municipality consists of a central town, or poblacion, and outlying rural villages. Subdivisions of both the poblacion and the outlying villages are called barangays or barrios. Each barangay consists of several (usually three to six) puroks. Outside the poblacion, puroks are natural villages each comprising 25 to 50 households.

From the 23 municipalities in Ilocos Norte, Laoag and Dingras were selected as the population to be sampled because of their contrasting characteristics (Table 1). Together they contain over 7,800 farm households, or approximately one-sixth of the farm households in the province (6).

Sampling was done in two stages. In the first stage, barangays or barangay groups (hereafter termed "villages") comprised

the primary sampling units. Villages were stratified into three locational strata based on location and diversification of cropping pattern. Greater diversification of cropping pattern was hypothesized to be an indicator of greater potential for vegetable production. Independent, systematic samples were drawn from each stratum (Table 2). For each stratum, probability of selection was proportional to the number of farm households in each village (5).

Table 1. Characteristics of population surveyed.

Characteristic	Laoag	Dingras
Degree of urbanization	Greater urbanization (60% of non-poblacion households are farming households)	Predominantly rural (75%, including poblacion households, are farming households)
Location	Coastal	Inland
Cropping Pattern	Greater diversification of cropping patterns, including vegetable production	Predominantly rice-growing

Table 2. Locational strata.

Locational stratum	Code	Characteristic	# of sample villages
Dingras	D	Inland - less diversified	3
Laoag A	LA	Coastal - more diversified	2
Laoag B	LB	Coastal - less diversified	2

In the second sampling stage, individual farm households were the sampling units. Within each village, farm households were stratified on the basis of tenancy (percentage of crop land from which the farmer keeps all the yield: <50% = tenant, ≥50% = owner-tiller) and farm area (<1.0 ha crop land = small, ≥1.0 ha crop land = large). Independent, random samples were drawn from each stratum in each village, with sampling fractions approximately equal among strata within each village. Frames for each village were obtained by a door-to-door census of all households in the seven sample villages. Total sample size was 175 households.

Price and market size were postulated to be the major factors which farmers consider in evaluating vegetable production alternatives. Hypotheses were proposed for seven vegetable crops (Table 3).

Based on the above sampling plan, interviews were conducted in September and October 1979 with each farm household head. Data on wholesale and retail farm product prices were gathered weekly in the Dingras public market from June through October 1979. Daily wholesale and retail farm product prices in the Laoag public market during the period 1975-1979 were obtained from local records (5).

Table 3. Crop hypotheses.

Crop	Consumption	Production experience	Willingness to try in rainy season	Advantage	Main problem
Tomato	All year; minimum/day	All	Yes; price and market	Large market	Disease
Mungbean	All year; minimum/week	All	Less	Large market	Low price
Sweet potato	All year	All	Less	Reliable yield	Low price
Common cabbage	Cool season	Large and/or owner-tiller	More	Price	Insects
Bell pepper	Little	Large and/or owner-tiller	Less	Price	Small market
Soybean	Don't know	Few	Less	Meat substitute	No market
Chinese cabbage	Don't know	Few	Less	Don't know	No market

Farm Size and Tenancy

Small farmers predominated in only one of the three locational strata. In the other two, small and large farmers were present in nearly equal proportions. In all three locations, small tenants were more numerous than small owner-tillers (Table 4). In addition, 73% of all sample tenants owned little or no land (<0.05 ha).

Table 4. Classification of sample village farm households by farm size and tenancy.

Locational stratum	Farm size and tenancy (%)					
	Marginal (<0.1 ha)	small (0.1 - <1.0 ha)		Total <1.0 ha	large (>1.0 ha)	
		tenant	owner-tiller		tenant	owner-tiller
Dingras	1	46	5	53	43	4
Laoag A	3	45	9	57	38	5
Laoag B	9	44	17	69	23	8

Slightly larger land areas were reported in the survey than in the census, but correlations between the two sets of responses were highly significant (Table 5). There were no significant differences between the census and the survey in the numbers of sample farmers classified as belonging to the small tenant, large tenant, and owner-tiller strata in either Laoag A, Laoag B, or Dingras.

Table 5. Mean areas of land reported in farmer census and survey.

Time of reporting	Area (ha)		
	Tenanted	Owned	Total
Census	0.76	0.14	0.90
Survey	0.82	0.17	0.99
Correlation	0.74**	0.65**	0.65**

** Significant at the 1% level.

Tomato Consumption and Production

Tomato consumption shows seasonal variation, with a 41% range between maximum and minimum months. Nevertheless, even at the minima, 51% of all farm households consume tomato (Figure 3). Thus, the demand for tomato is relatively high year-round, even in the rainy season. However, only 18% of the households had a weekly minimum requirement for tomato, and only 6% had a daily minimum requirement.

Local tomato production is more seasonal than consumption. Less than 5% of all farmers frequently plant between March and August (Figure 4). As a result, tomato prices exhibit marked seasonal variation (Figure 5).

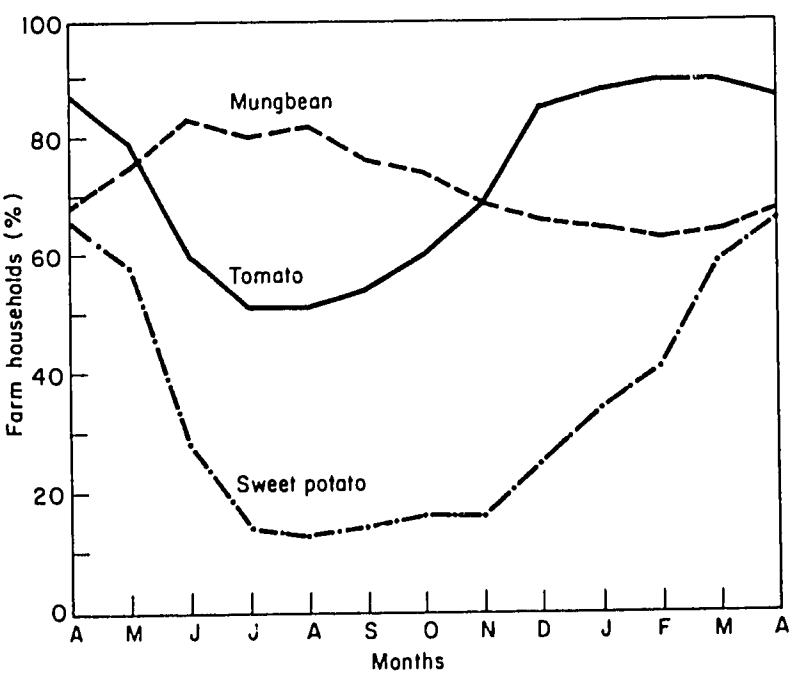


Figure 3. Months in which farm households consume tomato, mungbean, and sweet potato (percentage of farm households).

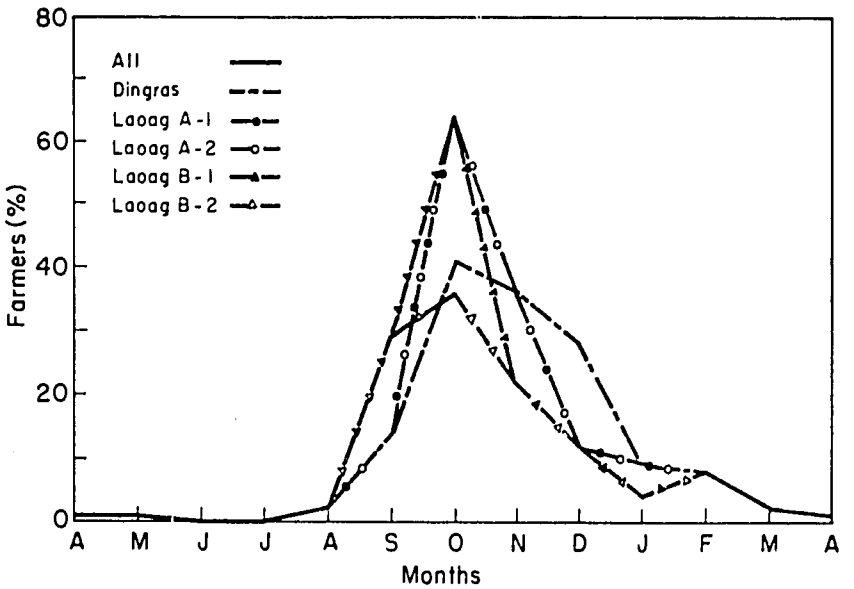


Figure 4. Months in which farmers most frequently plant tomato (percentage of farmers).

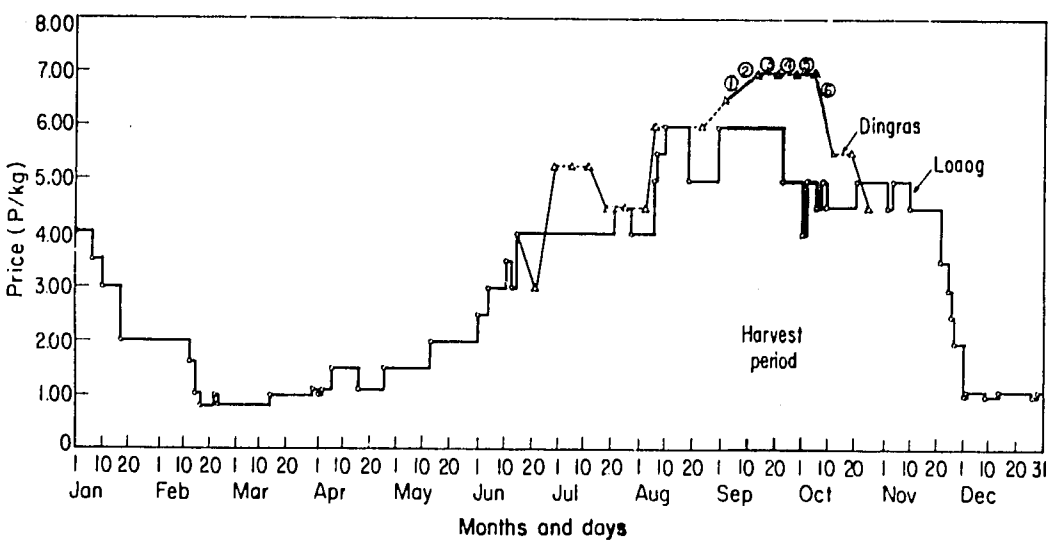


Figure 5. 1979 Dingras and Laoag tomato wholesale prices.

Nearly all farmers (95%) have grown tomato, but there was significant diversity among farmers both in planting times and reasons for different planting times. In five of the seven sample villages, significantly ($P<0.05$) more owner-tillers and large tenant farmers (37%) than small tenant farmers (19%) have planted tomato at the end of the rainy season to take advantage of higher prices (28% of the responses of owner-tillers and large tenant farmers, but none of the responses of small tenant farmers). In contrast, significantly ($P<0.05$) more small tenant farmers (64%) than large

tenant farmers and owner-tillers (48%) plant in October every year, when environmental conditions are more favorable but prices are lower. Only 7% or less of the reasons cited for planting in October were attributed to price.

The main advantage of growing tomato cited by farmers who have grown the crop was family use (69% of all responses). Economic returns were cited as an advantage in 30% of the responses.

Farmers considered plant growth, diseases, and pests to be the greatest problems in growing tomato (53-55% of all responses, depending on location). Pesticide costs were cited in 81% of the responses related to economic problems (12-32% of all responses, depending on location). None of the farmers cited low prices or inadequate markets as problems.

Pests made up 67% of the responses for problems associated with tomato plant growth, diseases, and pests, and 47% of the pest responses cited fruit worms. Fungal diseases were the most frequently cited (30%) diseases. Flower drop was the most frequently cited (70%) plant growth problem.

Mungbean Consumption and Production

Mungbean is predominantly a subsistence crop. Farm household mungbean consumption is high year-round with only a 20% difference between minimum and maximum months (Figure 3). In addition, 26% of the farm households had a minimum weekly requirement for mungbean. Only 2% had a minimum daily requirement, significantly less than the 6% with a minimum daily requirement for tomato.

In contrast with consumption, mungbean production is highly seasonal (Figure 6). Although production is as seasonal as tomato (concentrated in different months), and mungbean consumption is even more stable year-round than tomato, mungbean prices show less seasonal fluctuation than tomato (Figure 7). Farm households do not depend as much on the market for mungbean as for tomato because they can store mungbean over many months.

Nearly all farmers (97%) had experience with mungbean production. The month of February and the first week of August are the two main planting times for mungbean (Figure 6).

The fact that August, in the middle of the rainy season, is one of the two traditional planting times for mungbean was unexpected. Chi square tests found no significant differences among either locational or farm-type strata in reasons for planting in August (Table 6). Farmers call the first week of August planting time "Lunes ni Kodas," or "Judas' Monday," and 27% of the farmers who cited factors related to custom simply gave the response "Lunes ni Kodas" as their reason for planting in August.

A portion of the farmers gave more specific responses related to the environment. Included were: Dry spells in late July and August, the right amount of rain, the crop's tolerance to rainfall after germination, and the lack of wind and storms in August.

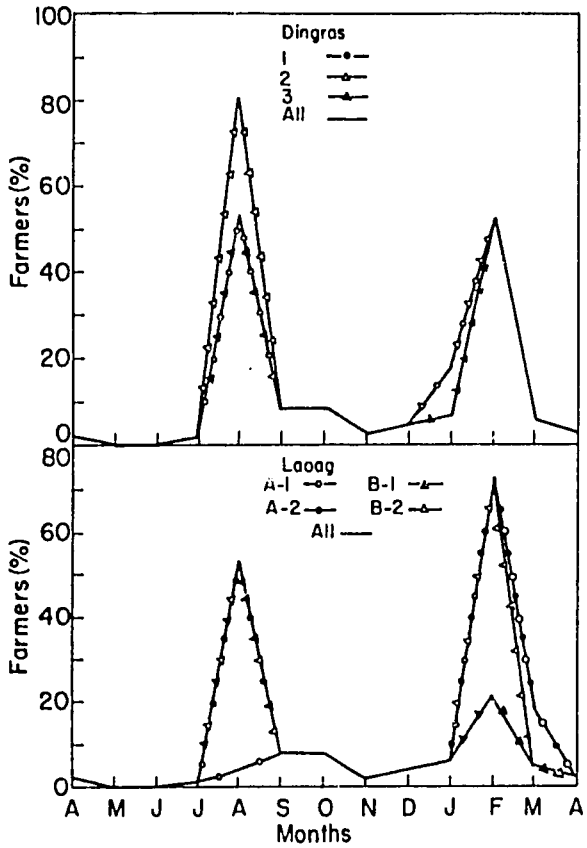


Figure 6. Months in which farmers most frequently plant mungbean (percentage of farmers).

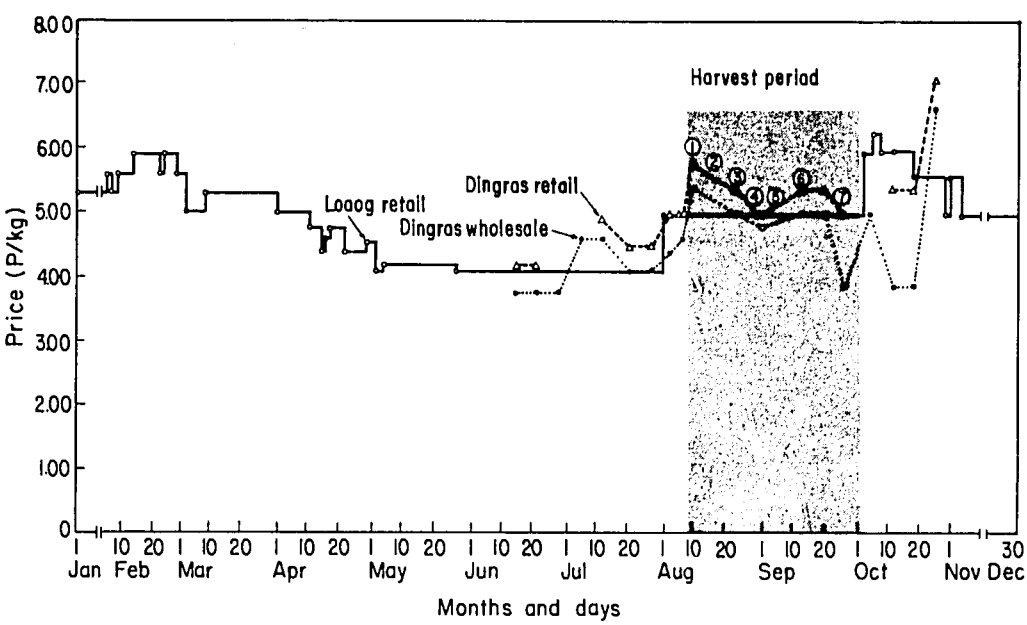


Figure 7. 1979 Dingras and Laoag mungbean wholesale and retail prices.

Table 6. Reasons for planting mungbean in August and February (percentage of all responses/month).

Month	Custom	Cropping pattern	Environment	Yield	Costs and returns	Other
August	49	13	18	6	1	14
February*	43	18	16	8	2	12

* Analysis for Laoag A only.

These responses suggest that the August planting date has evolved as a means of taking advantage of a specific environmental niche, but analysis of weather data recorded at the Gabu Airport near Laoag City (9) fails to correspond. From the last week of July until mid-August, the frequency of dry conditions decreases rather than increases. Mean rainfall rises sharply to 227 mm in the July 20-31 period, and the 142 mm mean rainfall in the August 1-10 period is considerably greater than the 49 mm in the July 1-10 period. In addition, the frequency of tropical weather systems was highest in August and September over the 31-year period 1948-1978 (12). Finally, high winds (≥64 km/hr) were recorded in August or September in 47% of the years, or approximately every other year, during the 15-year period 1965-1979 (9).

If neither less rain at planting time nor fewer storms or high winds afterwards make planting in August favorable, what then is the explanation for "Lunes ni Kodas?" Several farmers pointed out that there is no rain at flowering, fruiting, or harvest time when mungbean is planted in August. This observation is significant for two reasons. First, it is in agreement with the actual climatic pattern of rapidly decreasing rainfall after mid-September. Second, germination on the pod due to rain can seriously affect mungbean yield.

Why then do more farmers not plant mungbean at the same time as tomato or sweet potato (after the rains are finished, for example, in October) rather than in the middle of the rainy season in August? The explanation may lie in a combination of labor availability, subsistence needs, and avoidance of diseases. In August, rice transplanting is completed and farmers enter a slack period. Since mungbean is traditionally planted in August by broadcasting seed in upland areas, land preparation is not a problem even though the rainy season is nearing its peak. This could be the implicit logic behind the large number of responses related to custom and cropping pattern.

The primary advantage of growing mungbean is family use (69% of all responses of farmers who have planted mungbean). It is significant that the two main mungbean planting dates, August and February, divide the year in half. Among the other reasons for planting in August was the need for seed, a response given by 5% of the farmers. As one farmer explained, he plants in August because, "We will have used up all the seed we picked in May [from the February planting] for sida [food eaten with rice]."

In addition, planting too late can result in an increase in the incidence of powdery mildew. In the Philippines, powdery mildew is almost exclusively a disease of the cool, dry season (10,13). Farmers associate whitening of the leaves (the most outstanding symptom of powdery mildew) with dew. Another farmer explained that he planted in August because, "It isn't too cold, there isn't any dew yet, and the flowers are not damaged."

The implicit logic behind the February responses relating to custom and cropping pattern is probably also labor availability, since both harvesting of the main rice crop planted in July and the planting of the second rice crop on irrigated land is completed by February. The February responses also provide further evidence that disease avoidance is one of the reasons for the traditional planting times. Three farmers, each from a different barangay in Laoag, said that they planted in February because of less dew. Although February itself is the coolest month of the year, by the time the plants germinate and become well established, night temperatures will be higher and the danger of powdery mildew less. In addition, mungbean is a deep-rooted, drought-tolerant plant that will produce in the hot, dry months of March and April (8). On the other hand, mungbean planted in November or December is subject to conditions favorable to powdery mildew development throughout its growth. Conversely, conditions would be excessively dry for good germination if mungbean is planted in April. A late planting date also subjects the plant to heavy rain at fruiting and harvest.

The main problems cited by farmers in growing mungbean closely paralleled those given for tomato. Plant growth, diseases, and pests again ranked highest (48% to 63% of all responses, depending on location). Economic costs, primarily for pesticide (78% of all responses related to economic costs), were ranked second in five of seven villages. None of the farmers cited low prices or inadequate markets as problems.

In addition, no farmer mentioned repeated harvesting of mungbean as a disadvantage. A number of farmers who observed the field experiments or heard one of the introductory slide talks on rainy season vegetable production were impressed with the fact that AVRDC mungbean bore pods more than once. There is even a specific term in the farmers' vocabulary for a variety for which repeated harvesting is possible, "Adda darundonna." Breeding for more uniform maturity to reduce multiple harvesting of mungbean is one objective of the AVRDC mungbean program (1), but this objective may not be as important for subsistence production in the Philippines as it is in Taiwan where rural industrialization has created competition with agriculture for labor.

Farmer responses related to plant growth, diseases, and pests of mungbean were similar to those for tomato. Pests, especially pod worms, were most frequently cited (62%). Fungal diseases, including specific references to powdery mildew symptoms, were the most frequently cited diseases (41%), and flower drop was the most common plant growth problem (76%).

None of the farmers recognized that beanflies laying eggs early in the season on mungbean stems is a major cause of yield reduction. Research both at AVRDC and in the Philippines has demonstrated the importance of beanfly control during the first three weeks after germination (3,14), but IRRI investigators have also reported that farmers in other locations in the Philippines are unaware of the damage of beanflies on mungbean (11).

Sweet Potato Root Production and Consumption

As with mungbean, sweet potato root consumption and production are largely subsistence oriented. In contrast with mungbean, consumption is seasonal (Figure 3). Sweet potato roots are a snack food for which a significantly ($P<0.01$) smaller fraction of farm households (10%) have a minimum weekly requirement than they do for tomato (18%) or mungbean (26%)*.

Root consumption in the dry season follows planting concentrated in the October through December period (Figure 8). Market prices are relatively stable year-round, reflecting the subsistence nature of sweet potato root consumption and production (Figure 9).

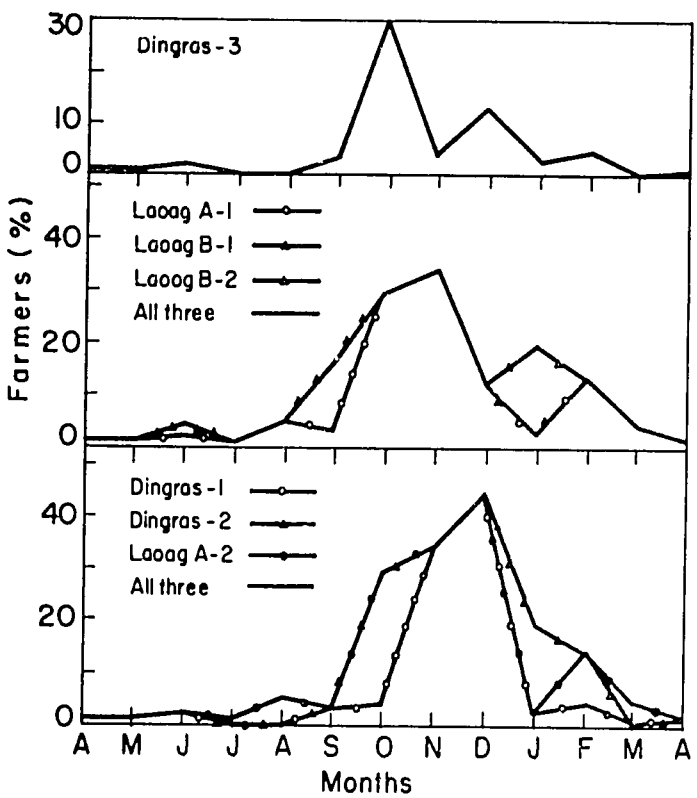


Figure 8. Months in which farmers most frequently plant sweet potato (percentage of farmers).

* Information on sweet potato tip consumption was not obtained from the 175 farm household sample.

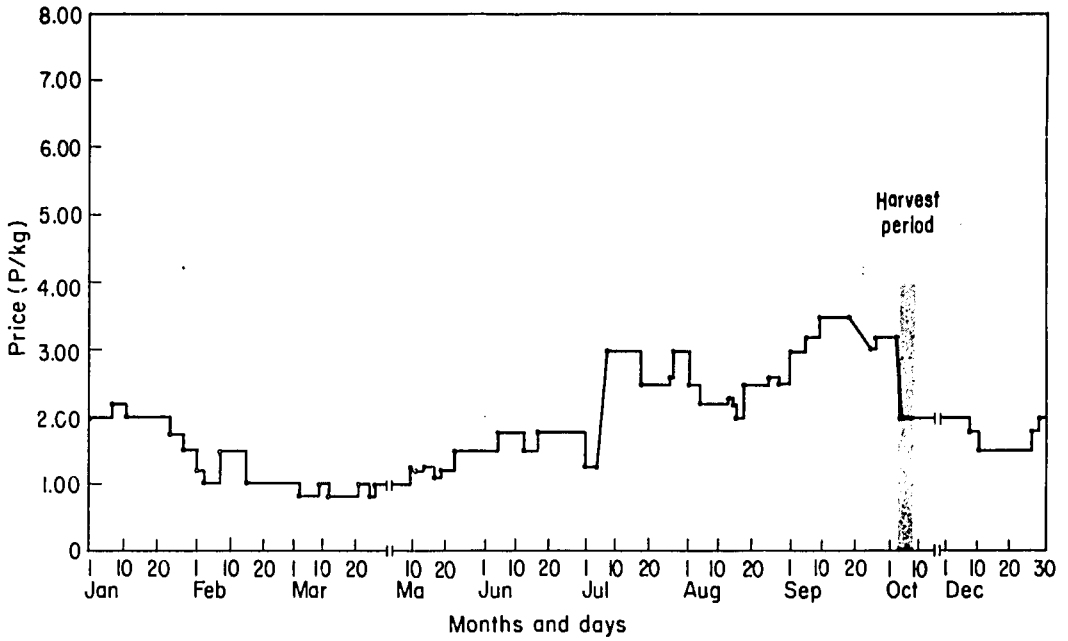


Figure 9. 1979 Laoag sweet potato retail prices.

Overall, 84% of all farmers have grown sweet potato, but there were significant ($P<0.05$) differences among villages in the percentage of farmers who have grown sweet potato (56% to 96% range). There were no differences among farm-type strata.

Chi-square tests found no significant differences among either locational or farm-type strata in reasons for planting sweet potato in October, November, or December. Custom, cropping pattern, environment, and yield comprised 90% to 100% of the responses for October, November, and December. Costs and returns were given in only 1% or less of all the responses. Overall, 50% to 71% of the farmers who planted sweet potato, depending on the village, cited family use as the main advantage of growing the crop.

In contrast with the many problems cited by farmers in tomato and mungbean production, 66% of all farmers said that they had no problems with sweet potato production. Only 9% of all responses cited problems related to plant growth, diseases, and pests. The most frequently cited problem was weevils (43%). Only 3% of all responses cited economic factors, all of which related to input costs and none to low prices.

Common Cabbage Consumption and Production

Farm household common cabbage consumption is seasonal, with a 40% range between maximum and minimum months (Figure 10). Cabbage production is even more seasonal, with no local production from March to August (Figure 11). As a result, cabbage prices are variable, especially in the small, non-urban Dingras market (Figure 12).

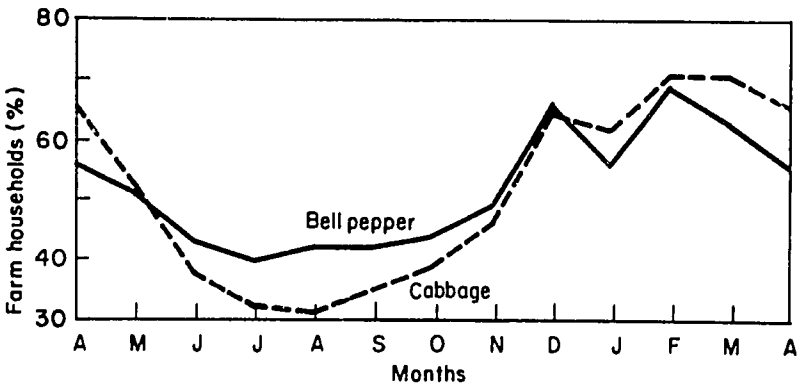


Figure 10. Months in which farm households consume bell pepper and common cabbage (percentage of farm households).

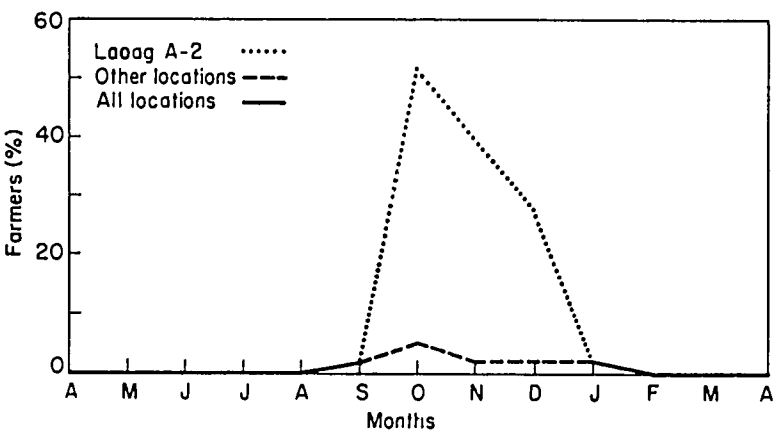


Figure 11. Months in which farmers plant common cabbage (percentage of farmers).

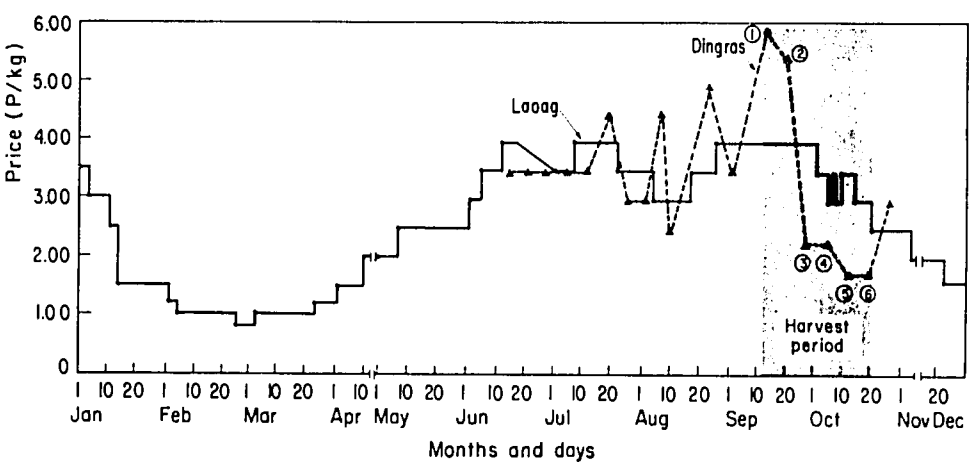


Figure 12. 1979 Dingras and Laoag common cabbage wholesale prices.

The fact that 31% or more of all farm households consume common cabbage during the rainy season, when there is no local production and when it must be bought on the market, suggests that common cabbage is more than a "treat" food for many farm households and that there is a fair degree of economic demand for its use as a supplementary food.

Chi-square tests of independence of farmer responses versus location, farm size, and tenancy strata identified highly significant ($P<0.01$) differences among locations and significant ($P<0.05$) differences among farm types in previous experience with cabbage production. Nearly three quarters (72%) of the farmers in one of the more diversified coastal villages (Laoag A-2) had grown cabbage. More owner-tillers and large tenant farmers (14%) in the remaining villages had grown cabbage than small tenant farmers (1%).

In addition, more owner-tillers and large tenant farmers (51%) than small tenant farmers (26%) had seen vegetable demonstration plots in two more diversified coastal villages. In four of the five less diversified villages, only 6% of all farmers had seen vegetable demonstration plots. More farmers (18%) in the diversified coastal villages sought additional information on new vegetable production technology than in the one inland village which also had greater exposure to vegetable production plots (4%). All the inland villages had adequate irrigation for year-round rice production but were located far from an urban market. Conversely, the diversified coastal villages had inadequate irrigation for rice monoculture but were close to an urban market. These results indicate that the stratification of villages by degree of diversification of cropping pattern was useful in identifying potential for greater vegetable production.

The reasons given by farmers in Laoag A-2 for planting common cabbage in October were predominantly related to custom and cropping pattern (71%). Only 6% of the farmers in that village cited economic factors as their reason for planting in that month. On the other hand, farmers in all villages who have grown common cabbage considered economic returns to be an important overall advantage in growing common cabbage (45% of all responses).

High input cost, pest control, and the need for sustained, intensive management were the farmers' major cabbage production problems (Table 7).

Bell Pepper Consumption and Production

Farm household bell pepper consumption is similar to that of cabbage. The range between amounts consumed in the maximum and minimum months is 29% (Figure 10). Bell pepper planting times were similar to those for tomato and cabbage (Figure 13).

Chi-square tests of independence revealed highly significant ($P<0.01$) differences among locations and significant ($P<0.05$) differences among farm types in previous experience with bell pepper production. Production was concentrated in the more

Table 7. Common cabbage and bell pepper production problems.

Problem	Percentage of responses			
	Category		Sub-category	
	Cabbage	Bell pepper	Cabbage	Bell pepper
Economic cost and returns	55	41		
Pesticide cost			67	42
Seed cost			33	33
Low price			0	17
No market			0	4
Fertilizer cost			0	4
Plant growth, disease, and pests	24	36		
Lodging and flower drop			0	10
Sunburn, virus, or rot			0	29
Pests			100	62
Difficulty of work and resource availability	13	5		
Other	5	14		
None	3	3		

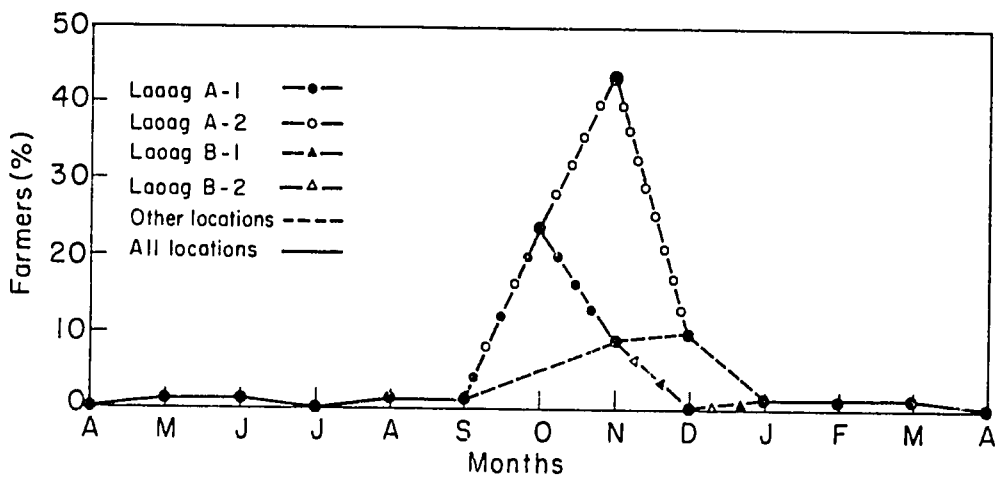


Figure 13. Months in which farmers plant bell pepper (percentage of farmers).

diversified coastal Laoag villages and in one inland Dingras village. Nearly half (41%) of the farmers in those villages had grown bell pepper compared with only 6% in other villages. In the villages with more farmers who had grown bell pepper, more owner-tillers and large tenant farmers (52%) had grown it than small tenant farmers (23%). These results also support the usefulness of the locational and farm type stratification.

The reasons given by farmers for planting bell pepper in November were related predominantly to custom and cropping pattern (37%), favorable environment (30%), and yield (15%). Only 7% of the farmers who have planted bell pepper in November cited economic factors as a reason for planting in that month. As with

cabbage, economic returns are a major overall advantage of growing bell pepper (48% of all responses).

There was greater diversity in problems cited by farmers for bell pepper than for common cabbage, but insect pests and pesticide costs were again most frequently cited (Table 7).

Soybean Consumption and Production

Consumption of soybean is distributed over the entire year (Figure 14). There is only a 5% range between maximum and minimum consumption. Nearly one half (44%) of all farm households consume soybean regularly at least one month of the year. Only 11% stated they had never seen or had an opportunity to taste soybean. The remaining 45% did not consume soybean either because they were unaccustomed to it, because of its unavailability, or because of the availability of substitutes.

Nearly one-third of all farmers (31%) had grown soybean. There were no significant differences in farmer experience with soybean, either among villages or farm types.

Soybean planting times are distributed throughout much of the year. In one Dingras village, however, 32% of the farmers have planted in May (Figure 15). These farmers appear to consider soybean rain tolerant. Two farmers even stated that soybean "prefers rain."

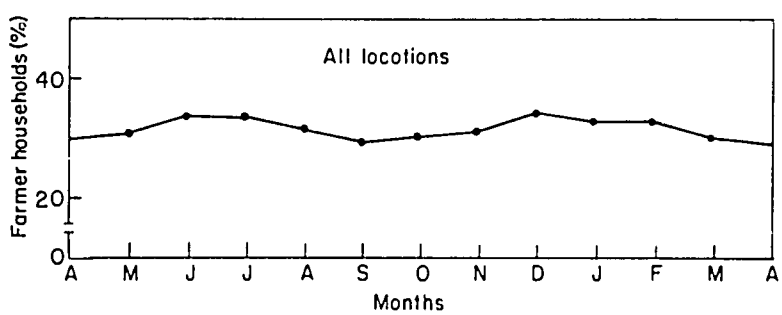


Figure 14. Months in which farm households consume soybean (percentage of farm households).

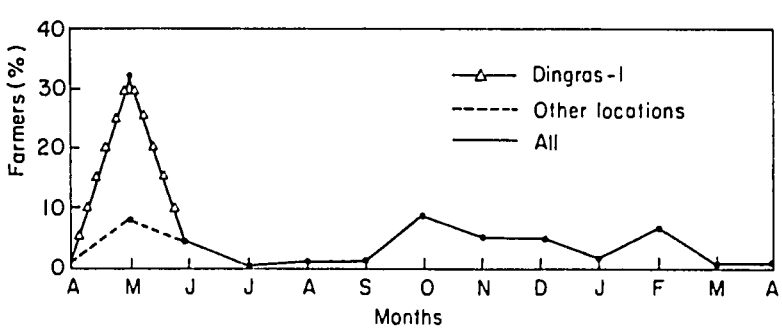


Figure 15. Months in which farmers plant soybean (percentage of farmers).

Farmers who have planted soybean consider family use to be the crop's main advantage (80% of all responses). The majority of those responses, 71%, cited the use of soybean as a coffee substitute. None stated that soybean could serve as a meat substitute.

Only 2% of all responses cited lack of a market as a disadvantage. Slightly under half of the farmers who have planted soybean stated they had no problems with its production (44% of all responses).

Among responses relating to plant growth, diseases, and pests, 75% involved insect pests, especially worms on the flowers or fruit. None cited beanfly as a soybean production problem. This omission parallels the tendency observed with mungbean for farmers to identify large, conspicious insect pests as their major pest problems. In addition, none of the farmers cited either soybean rust or powdery mildew, although the former disease, a major focus of the soybean pathology and breeding research programs at AVRDC, is prevalent throughout tropical Asia and can cause as much as 68% reduction in yield (1,2,3,4,16).

In the category of responses related to the difficulty of work and availability of resources, 57% cited shelling problems as a disadvantage of growing soybean.

Chinese Cabbage Consumption and Production

As hypothesized, Chinese cabbage is an essentially unknown crop. Only 2% of all farmers have ever planted the crop. These were all in the Laoag A-2 village where nearly three-fourths of the farmers have grown common cabbage. A few farm households in each village said that they consume Chinese cabbage, but these comprise only 8% of all farm households. The majority of farmers (63%) said they had never seen or had the opportunity to taste Chinese cabbage.

Summary and Conclusions

Survey results are summarized in Table 8. Consumption of several of the seven vegetables studied is less seasonal than originally hypothesized. The one exception to this trend is sweet potato. On the other hand, production of these vegetables is more subsistence oriented than was originally hypothesized.

The latter finding was surprising in light of the widespread availability of consumer market goods in the Philippines and the demand for them by rural people. The desire of farm households for market goods, more education for children, and the like is obvious from casual conversation with people in farm villages in the Philippines. Increased value is being placed on those aspects of well-being that must be purchased.

An underlying hypothesis of this study was that farm households seek additional sources of income in response to this desire and evaluate vegetable production alternatives primarily in terms of their potential value for income generation.

Table 8. Summary of survey results.

Crop	Consumption	Production experience	Willingness to try in rainy season	Advantage	Main problem
Tomato	Relatively high all year	All	Large tenants and owner-tillers: price and market	Family use	Fruit pests, pesticide cost
Mungbean	All year; substanital minimum/ week	All	Yes: custom (= subsistence)	Family use	Pod pests, pesticide cost
Sweet potato	Cool season; snack food	Most	Little:"treat" food	Family use	None
Common cabbage	Some all year	Near larger market or large tenants and/ or owner-tillers	Less: difficulty of management	Family use and sale	Insect pests, pesticide cost
Bell pepper	Some all year	Primarily more diversified; large tenants and/ or owner-tillers	?	Family use and sale	Insect pests, pesticide cost
Soybean	Some all year	Nearly one third in all locations and farm types	Some: rain tolerant	Coffee substitute	None
Chinese cabbage	Little	Few; only in village with most common cabbage experience	?	?	?

In the conclusions of his study on why farmers in Taiwan plant what they do, Calkins distinguished between "Type I" studies of individual farms and "Type II" studies of whole commodity industries based on secondary statistical data obtained from villages, districts, regions, or whole nations. Calkins argued that it is necessary to begin with Type I studies in order to determine how transition from subsistence to increased market production of horticultural crops can occur (7).

The above argument rests on a hypothesis that underlies the focus of AVRDC's efforts in the 1970's and influenced this study as well. That hypothesis can be expressed as follows: Tailoring

production technology to enable farm households to take advantage of market opportunities is a more effective way to increase vegetable supplies, and thereby improve nutrition, than tailoring production technology to subsistence production for direct home use (15). The findings presented here suggest, however, that farmers do not see potential for major increases in income through the production alternatives currently available for the seven noted vegetable crops. The rationale for the "Lunes ni Kodas" planting date shows how the outstanding rainy season production alternative currently available to farm households - mungbean planted in August - fulfills subsistence needs rather than serves as a source of income.

These findings pose the following question: Can AVRDC technology be tailored to create a new "Lunes ni Kodas?" The new "Lunes ni Kodas" would be a rainy season planting time based on an alternative combination of a vegetable crop and production techniques that farm households would adopt with the conscious goal of earning higher income in order to satisfy their desire for market goods. Other portions of this study, to be reported later, will evaluate the results of the field experiments and examine the economic benefits which the most promising crop and production techniques might provide farm households.

Finally, in light of these findings, it is significant that AVRDC has recently increased its emphasis on developing vegetable production technology suited for home gardens. Technologies for both types of strategies, production for income generation and improved subsistence production, are needed. It is the task of technology tailoring to examine each specific situation and determine the applicability and the limits of the two types of strategies.

Literature Cited

1. AVRDC. 1976. Progress report for 1975. Shanhua, Taiwan, Republic of China.

2. _____. 1977. Progress report for 1976. Shanhua, Taiwan, Republic of China.

3. _____. 1978. Progress report for 1977. Shanhua, Taiwan, Republic of China.

4. _____. 1979. Progress report for 1978. Shanhua, Taiwan, Republic of China.

5. Bureau of Agricultural Economics, Republic of the Philippines. 1979. Unpublished data. Laoag City, Ilocos Norte, Philippines

6. Bureau of Agricultural Extension, Republic of the Philippines. 1979. Unpublished data. Laoag City, Ilocos Norte, Philippines.

7. Calkins, P. H. 1978. Why farmers plant what they do. AVRDC technical bulletin, No. 8. Shanhua, Taiwan, Republic of China.

8. Chiang, M. Y. and J. N. Hubbell. 1978. Effect of irrigation on mungbean yield. In: Proceedings of the 1st international mungbean symposium. Asian Vegetable Research and Development Center, Shanhua, Taiwan, Republic of China.

9. Gabu Weather Station, Philippine Atmospheric, Geophysical, and Astronomical Services Administration, Ministry of National Defense. 1965-1980. Unpublished daily weather records. Gabu, Laoag City, Ilocos Norte, Philippines.

10. Ilag, L. L. 1978. Fungal diseases of mungbean in the Philippines. In: Proceedings of the 1st international mungbean symposium. Asian Vegetable Research and Development Center, Shanhua, Taiwan, Republic of China.

11. Litsinger, J. A., E. C. Price, R. T. Herrara, J. P. Bandong, M. D. Lumaban, C. B. Quirino, and M. D. Castillo. 1978. Introducing pest control technology to a low management crop: The mungbean example in the Philippines. In: Proceedings of the 1st international mungbean symposium. Asian Vegetable Research and Development Center, Shanhua, Taiwan, Republic of China.

12. Ministry of National Defense, Philippine Atmospheric, Geophysical, and Astronomical Services Administration. 1978. Tropical cyclone summaries from 1948 to 1978. Manila, Philippines.

13. Querebral, F. C. 1978. Powdery mildew and Cercospora leaf spot on mungbean in the Philippines. In: Proceedings of the 1st international mungbean symposium. Asian Vegetable Research and Development Center, Shanhua, Taiwan, Republic of China.

14. Rejesus, R. S. and V. P. Banasihan. 1979. Critical growth stages for insecticidal application in mungbean. In: Proceedings of the 1st international mungbean symposium. Asian Vegetable Research and Development Center, Shanhua, Taiwan, Republic of China.

15. Riley, J. J. Associate Director, AVRDC (personal communication).

16. Shanmugasundaram, S. 1979. Suggested cultural practices for soybean. International cooperators guide. Asian Vegetable Research and Development Center, Shanhua, Taiwan, Republic of China.