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# CLIMATE VARIABILITY, SEASONAL CLIMATE FORECAST AND CORN FARMING IN ISABELA, PHILIPPINES: A FARM AND HOUSEHOLD LEVEL ANALYSIS*

Celia M. Reyes, Sonny N. Domingo, Christian D. Mina, and Kathrina G. Gonzales†

## ABSTRACT

Seasonal Climate Forecast (SCF) is one of the tools, which could help farmers and decision makers better prepare for seasonal variability. Using probabilistic principles in projecting climatic deviations, SCF allows farmers to make informed decisions on the proper choice of crop, cropping schedule, levels of input and use of mitigating measures. However, a cloud of uncertainty looms over the true value of SCF to its target users.

To shed light on the true value of SCF in local agricultural decision making and operations, farm and household level survey was conducted. A total of 85 corn farmers from the plains and highlands of Echague and Angadanan, Isabela were interviewed.

Results showed that climate and climate-related information were undoubtedly among the major factors being considered by farmers in their crop production activities. All aspects explored on the psychology of corn growers pointed to the high level of importance given to climatic conditions and SCF use. This was evident on the farmers' perceptions, attitudes, and decision-making processes.

Though the high regard of farmers on climate forecast and information cannot be questioned, actual application of such information seemed still wanting. Most corn farmers still started the season by "feel"—relying on the coming of rains and usual seasonal cropping schedules when commencing key farm operations. Reliable indigenous knowledge on climate forecasting was scarce. With corn farmers in Isabela still thirsting for climate-related information, the delivery of appropriate information and accurate forecasts should be addressed through proper extension and provision of support.

Overall, SCF still has to solidify its role in the decision making process. Reliable SCFs remain the key to answer the riddle of seasonal variability and allow farmers to securely harness the goodness of the changing seasons. Ultimately, a holistic approach is necessary to truly elevate the productivity in Isabela's corn lands.

Keywords: Seasonal climate forecast, corn productivity, Isabela corn industry, climate variability, climate information and corn farming

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# Climate Variability, Seasonal Climate Forecasts and Corn Farming in Isabela Philippines: A Farm and Household Level Analysis

## 1.0 Introduction

**1.1 <u>The Corn Crop</u>**. A typical cropping cycle for corn requires only 90-120 days after planting (DAP) to complete. Boiler type (food) corn could be harvested in 65 to75 DAP, and baby corn (vegetable) could already be marketed after only 50DAP.

Climatic variability and pests and diseases are the main challenges confronting local farmers. Since most corn producing areas are rainfed, they depend greatly on rains to have a good cropping season. Those without supplemental irrigation risk getting their standing crop wiped out during prolonged dry spells or drought. But excessive rains and flooding could also as easily destroy the season's crop. Add the two most economically significant pests of the corn crop-- the Asiatic Corn Borer and weeds—and you have a complex mix of concerns.

Varietal choice is said to spell a lot of difference when projecting yield. But looking at established figures, all commercial corn varieties have potential yields of more than 6Mt per hectare. With the average national corn yield only reaching about 2MT, a lot could be said about the management practices among local growers. Either the seed companies have been exaggerating claims of varietal productivity, or local cropping practices greatly fall short of meeting the optimum needs of the crop. Whatever reason there is, the level of productivity in the country's corn producing areas must be improved.

Farmers could now choose to grow three types of corn varieties: hybrid, open pollinated or Bt (biotech). Hybrid varieties yield much higher than open pollinated varieties(OPV), but are priced higher and require more inputs. Hybrid seeds are designed to be used for just one season, while OPV could be used for multiple seasons. Biotech corn beats conventional hybrid and OPV seeds by exhibiting genetic resistance to major pests. Though priced much higher, Bt corn compensates through lesser yield loss from pest attacks. Advocates claim that in severe corn borer infested areas, the yield advantage of biotech corn over other varieties could go as high as 25 to 30 percent.

**1.2 <u>Corn requirements and physiology.</u>** Corn requires less production inputs, especially water, compared to rice. Corn also thrives well in marginal areas, making it a viable source of livelihood for resource-constrained smallholder farmers.

The most desirable soil for corn production is deep, medium textured, well drained, and with high organic matter and water holding capacity. Soil types with these characteristics are loam, silt loam, and silty clay loam (PCARRD, 1981). Land is prepared as early as one month before the actual planting date. It is plowed and then harrowed two weeks after to meet the desired soil texture. Plowing is done when the field is of the right moisture content.

A corn plant requires 4 to 5mm of water per day. During critical periods like silking and soft dough stages, the requirement could be as much as 6 to 8mm/day. If the crop does not receive enough water during this period, as much as 20 to 50% yield could be lost. Lansigan, et.al (2004) estimated that the most critical point falls around 55 DAP. Other literatures state that water should be available at 40 DAP during the start of flowering/reproductive stage. In areas where water is not a problem, farmers are advised to irrigate every two weeks.

Harvesting is done when the crop reaches its physiological maturity at around 90-120 DAP. Signs of grain maturity include drying-up of the corn ear and darkening of the base of kernels.

**1.3 Corn and climate variability**. Most of the country's corn-producing areas are rainfed. Farmers await the coming of rains before planting the season's crop. A good cropping is highly dependent on sustained rainfall, especially during the critical stages of crop development. One could therefore equate good seasonal precipitation to a good corn cropping season. In the same light, climatic irregularities could spell disaster to local growers.

Seasonal climatic variability is a major challenge to many. More frequent occurrences of El Niño and La Niña phenomena during the past decade have made this concern very apparent. Without assured rainfall, the risk involved in rainfed farming is multiplied by so many folds. And with most rainfed farmers belonging among the poorest of the poor, improper timing or commencement of planting is a mistake many cannot afford.

Proper issuance of seasonal climate forecasts would give rainfed farmers a certain level of confidence in their on-farm decision-making. Though natural climatic occurrences are beyond the control of man, farming operations could be tapered to reduce losses from dry spells or eventual floodings.

## 2.0 Corn Farming in Isabela, Philippines

**2.1 The corn industry.** Corn is the second most important cereal crop in the Philippines. It is the staple food of many Filipinos from the south. Five million Filipinos depend on the commodity for their livelihood. In terms of gross value added (GVA) in agriculture, corn ranks third overall--next only to rice and coconut (PCARRD,2005).

In 2005, corn registered an output of 5.3 million metric tons, 2.9% short of the previous year's record of 5.4 million metric tons. Productivity slightly improved by 0.5% owing to increased use of good quality seeds. However, there was an 85 thousand hectare drop in area harvested. Extended dry spell during the first semester of the year and flooding/excessive rains before yearend caused most of the losses. Forecasts of corn production for the first half of 2006 suggested good recovery and positive growths. Palay and corn performance for the initial half of 2006 looked promising given improved weather conditions.(BAS 2006)

**Table 1. Corn yield (MT/ha) from 1996 to 2005**

| Region/Province | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| Philippines | 1.52 | 1.59 | 1.62 | 1.74 | 1.80 | 1.82 | 1.80 | 1.92 | 2.14 | 2.15 |
| Region II | 2.05 | 2.56 | 2.40 | 3.11 | 3.23 | 3.09 | 3.04 | 3.33 | 3.79 | 2.98 |
| Isabela | 2.22 | 2.70 | 2.49 | 3.25 | 3.44 | 3.21 | 3.21 | 3.54 | 3.91 | 3.11 |

Note: computed from BAS data, 2006

**Table 2. Corn area harvested in hectares by region/province, 1996-2005**

| Region/Province | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| Philippines | 2,735,723 | 2,725,875 | 2,354,208 | 2,642,208 | 2,510,342 | 2,486,588 | 2,395,456 | 2,409,828 | 2,527,135 | 2,441,788 |
| CAR | 22,777 | 24,892 | 22,913 | 27,520 | 27,337 | 33,058 | 32,954 | 31,211 | 34,961 | 42,010 |
| Region I | 62,208 | 62,662 | 69,877 | 59,121 | 52,490 | 51,590 | 52,869 | 53,837 | 56,305 | 67,298 |
| Region II | 226,911 | 261,253 | 237,520 | 331,367 | 294,546 | 293,385 | 273,562 | 247,142 | 316,411 | 258,180 |
| Isabela | 142,560 | 160,066 | 145,864 | 226,710 | 196,681 | 201,740 | 172,717 | 163,914 | 217,333 | 165,049 |
| Region III | 18,809 | 21,676 | 33,056 | 25,677 | 24,517 | 31,841 | 33,739 | 36,823 | 36,921 | 44,500 |
| Region IV-A | 43,017 | 39,316 | 35,252 | 36,110 | 36,757 | 36,520 | 35,403 | 36,480 | 37,298 | 36,365 |
| Region IV-B | 40,108 | 41,964 | 23,604 | 32,995 | 33,369 | 31,090 | 31,318 | 28,266 | 29,729 | 36,407 |
| Region V | 120,140 | 115,815 | 100,162 | 96,240 | 81,124 | 84,529 | 88,429 | 81,762 | 81,068 | 80,237 |
| Region VI | 92,573 | 92,215 | 66,210 | 72,486 | 81,813 | 75,067 | 77,440 | 81,827 | 88,700 | 107,030 |
| Region VII | 259,280 | 243,371 | 222,932 | 229,944 | 228,981 | 238,438 | 241,833 | 244,699 | 244,259 | 246,463 |
| Region VIII | 59,396 | 61,343 | 52,956 | 58,719 | 58,303 | 57,687 | 57,415 | 56,969 | 56,858 | 58,589 |
| Region IX | 211,635 | 219,346 | 218,484 | 197,756 | 173,562 | 175,261 | 176,155 | 184,992 | 183,005 | 163,365 |
| Region X | 450,205 | 439,104 | 402,188 | 399,866 | 384,388 | 377,933 | 339,707 | 377,276 | 393,149 | 381,499 |
| Region XI | 213,523 | 202,961 | 174,472 | 183,108 | 181,340 | 177,217 | 189,582 | 195,783 | 203,420 | 200,409 |
| Region XII | 566,328 | 529,107 | 376,604 | 515,749 | 472,694 | 445,148 | 433,379 | 421,326 | 418,019 | 398,343 |
| CARAGA | 51,042 | 54,444 | 53,276 | 41,068 | 49,713 | 47,782 | 51,357 | 49,839 | 57,055 | 55,765 |
| ARMM | 297,771 | 316,406 | 264,702 | 334,482 | 329,408 | 330,042 | 280,314 | 281,596 | 289,977 | 265,328 |

Source: BAS, 2006

**Table 3. Corn volume of production in metric tons by region/province, 1996-2005**

| Region/Province | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| Philippines | 4,151,332 | 4,332,417 | 3,823,184 | 4,584,593 | 4,511,104 | 4,525,012 | 4,319,262 | 4,615,625 | 5,413,386 | 5,253,160 |
| CAR | 34,533 | 41,910 | 40,298 | 67,005 | 72,415 | 93,552 | 93,611 | 84,162 | 106,282 | 130,464 |
| Region I | 162,610 | 199,729 | 214,469 | 180,706 | 173,446 | 182,666 | 182,061 | 196,679 | 223,855 | 300,184 |
| Region II | 466,228 | 669,821 | 571,208 | 1,029,863 | 951,904 | 907,177 | 832,411 | 824,053 | 1,198,394 | 769,506 |
| Isabela | 316,853 | 432,937 | 362,612 | 736,112 | 675,716 | 647,979 | 554,176 | 580,128 | 850,046 | 513,687 |
| Region III | 52,805 | 70,974 | 117,739 | 77,459 | 77,298 | 114,065 | 122,546 | 143,619 | 147,230 | 182,333 |
| Region IV-A | 47,215 | 44,452 | 39,060 | 40,821 | 41,308 | 42,297 | 41,309 | 42,772 | 53,034 | 64,102 |
| Region IV-B | 63,639 | 67,137 | 27,311 | 55,812 | 56,526 | 58,755 | 62,005 | 59,359 | 67,564 | 94,161 |
| Region V | 101,482 | 99,157 | 75,083 | 83,541 | 62,787 | 62,842 | 73,963 | 66,361 | 81,285 | 118,115 |
| Region VI | 72,119 | 80,652 | 77,619 | 68,510 | 80,340 | 75,540 | 87,065 | 128,728 | 138,205 | 193,736 |
| Region VII | 159,042 | 142,908 | 141,188 | 138,618 | 137,536 | 154,011 | 166,960 | 192,061 | 183,995 | 188,525 |
| Region VIII | 43,156 | 44,307 | 33,349 | 45,813 | 46,306 | 47,525 | 49,651 | 51,835 | 59,906 | 68,416 |
| Region IX | 191,861 | 182,922 | 196,722 | 122,306 | 123,233 | 134,309 | 135,072 | 176,287 | 199,631 | 223,208 |
| Region X | 816,424 | 875,027 | 840,997 | 776,819 | 777,828 | 798,733 | 701,211 | 817,182 | 927,689 | 938,227 |
| Region XI | 150,413 | 144,737 | 131,940 | 145,814 | 151,307 | 148,406 | 181,947 | 214,344 | 247,781 | 293,413 |
| Region XII | 1,117,688 | 959,380 | 777,732 | 1,028,086 | 990,300 | 919,042 | 885,055 | 870,124 | 1,025,312 | 959,286 |
| CARAGA | 45,433 | 49,875 | 71,575 | 37,434 | 70,959 | 67,747 | 68,043 | 74,545 | 95,260 | 98,595 |
| ARMM | 626,684 | 659,429 | 466,894 | 685,986 | 697,611 | 718,345 | 636,352 | 673,514 | 657,963 | 630,889 |

Source: BAS, 2006

**2.2 <u>Isabela as top producing province</u>.** Until 2004, Isabela ranked as the number one corn producing province in the country. Over the years, the province had been a consistent top producer with a national production share ranging from 9 to 16 percent. In 2004, it posted an impressive national share of 16%, producing a total volume of 850,000MT.

However, in 2005, provincial production fell by 40% (340,000MT), decreasing its share of the national production pie to only 10%. Isabela had to settle for second place in the corn production race due to dry spells in the early part of the year and flooding in September and December. Bukidnon province overtook it with a record production high of 651,136MT.

The key to Isabela's productivity is its extensive broad and flood plains. Hilly areas are also used for planting corn. The crop grows well in the province even without irrigation infrastructure, with the local climate classification bordering on types III and IV (no pronounced dry season and even rainfall distribution year-round).

As of 2005, the top producing municipalities in Isabela were: San Agustin, Naguilian, San Guillermo, San Mariano, Tumauini, Angadanan, Jones, Echague, Cauayan City and Ilagan.

**Table 4. Top corn-producing municipalities per district, 2003-2004**

| District | Municipality | Production | | Area | |
|---|---|---|---|---|---|
| | | Metric Tons | Rank | Hectarage | Rank |
| I | Ilagan | 57,872 | 1 | 16,474 | 1 |
| | Tumauini | 29,946 | 6 | 7,585 | 5 |
| II | San Mariano | 24,341 | 7 | 6,080 | 7 |
| | Naguilian | 20,546 | 9 | 5,253 | 8 |
| | Benito Soliven | 18,658 | 11 | 4,616 | 9 |
| III | Cauayan City | 51,117 | 2 | 11,874 | 2 |
| | Angadanan | 29,998 | 5 | 7,267 | 6 |
| | San Guillermo | 21,355 | 8 | 3,378 | 11 |
| IV | Echague | 42,165 | 3 | 9,844 | 3 |
| | Jones | 35,507 | 4 | 8,491 | 4 |
| | San Agustin | 18,789 | 10 | 3,637 | 10 |

**2.3 <u>Production vs. climatic variability</u>.** Most of Isabela's prime corn lands are rainfed. Irrigated farms are usually reserved for rice growing, with farmers putting more value on this staple crop. Though such is the case, the province remains one of the top producers of corn in the country.

Planting in the country's less developed agricultural lands, however, has its price. Without assured irrigation, farmers are at the mercy of nature. Because of this, the effects of climatic variabilities are very much felt in Isabela.

Since 1990, several cycles of El Niño and La Niña have wrought havoc to the local farming community. In the year 2005 alone, local farmers experienced dry spells and bouts of flooding causing a total damage of P838Million. These events caused many farmers to replant 2-3 times in two consecutive cropping seasons. The 6 percent decrease in national corn production share was attributed to these aberrations of nature. The extent of impact on the livelihood and socio-economic conditions of farmers could be much worse.

Proper timing and a good seasonal climate advisory would have spared many farmers from going through so much loss.

**Table 5. Damages on Corn Production in Isabela Caused by Drought and Flooding in 2005**

| Event | Duration | Total Affected Area (Ha) | Production Loss(MT) | Total Cost (P) |
|---|---|---|---|---|
| **El Niño Months** | | | | |
| Drought | Jan-Mar 2005<br>June-Aug 2005 | 93,359 | 206,153 | 609,281,264.00 |
| **La Niña Months** | | | | |
| Flooding due to excessive rains caused by typhoon “Labuyo" and ITCZ | Sept. 2005 | 7,273 | 13,789 | 59,203,768.00 |
| Flooding due to excessive rains caused by typhoon “Quedan" and Monsoon Rains | Dec. 2005 | 25,688 | 71,492 | 169,023,157.00 |
| **TOTAL** | | **126,320** | **291,434** | **837,508,189** |

Source: Department of Agriculture, 2006
Note: Production in Isabela actually decreased by 40% or 340,000MT in 2005, decreasing its national production share to only 10%

## 3.0 Farm and household level study on corn farming and value of SCF

**3.1 Valuing Seasonal Climate Forecast (SCF).** SCF is one of the tools, which could help farmers and decision makers better prepare for seasonal variability. SCF applies probabilistic principles in projecting climatic deviations. The Philippine Atmospheric Geophysical, Astronomical Service Administration (PAGASA) is presently using the ACIAR-developed RAINMAN, together with other tools, in coming-up with SCFs.

Appropriate warnings through SCFs could help farmers cope-up with climate variability by allowing them to make informed decisions on the proper choice of crop, timing of cropping period, levels of input use and use of other mitigating measures. However, a cloud of uncertainty looms over the true value of SCF to its target users.

The accuracy of forecasts, the accessibility of information, the general psychology of Filipino farmers and the interplay of these elements– determine the significance of SCF to Philippine agriculture in general and on-farm decision making in particular. Proper accounting of these elements and the dynamics in the field would allow for better risk management at the local and national level.

To shed light on the true value of SCF in local agricultural decision making and operations, farm and household level surveys were conducted in select provinces in the Philippines.

**3.2 Conceptual Framework**. On-farm decision making among corn farmers is a complex and dynamic exercise. With crop productivity as end-goal, processes toward coming-up with production decisions oftentimes involve the consideration of both internal and external elements. Farmers consider climate and other biophysical elements such as pests and diseases and soil, irrigation and other related resources. Societal influences, economic factors, and the overall psychological makeup of the farmer complete the mix. The challenge for change agents is to diligently consider this complex mix in addressing needs and identifying appropriate entry points for institutional support like SCF and development interventions.

This study attempted to characterize the corn farmer, by focusing on attributes that influence his decision-making in relation to corn farming and use of SCF and other climate information. This would allow for better understanding of the subject and permit a more workable fit between needs and proposed interventions.

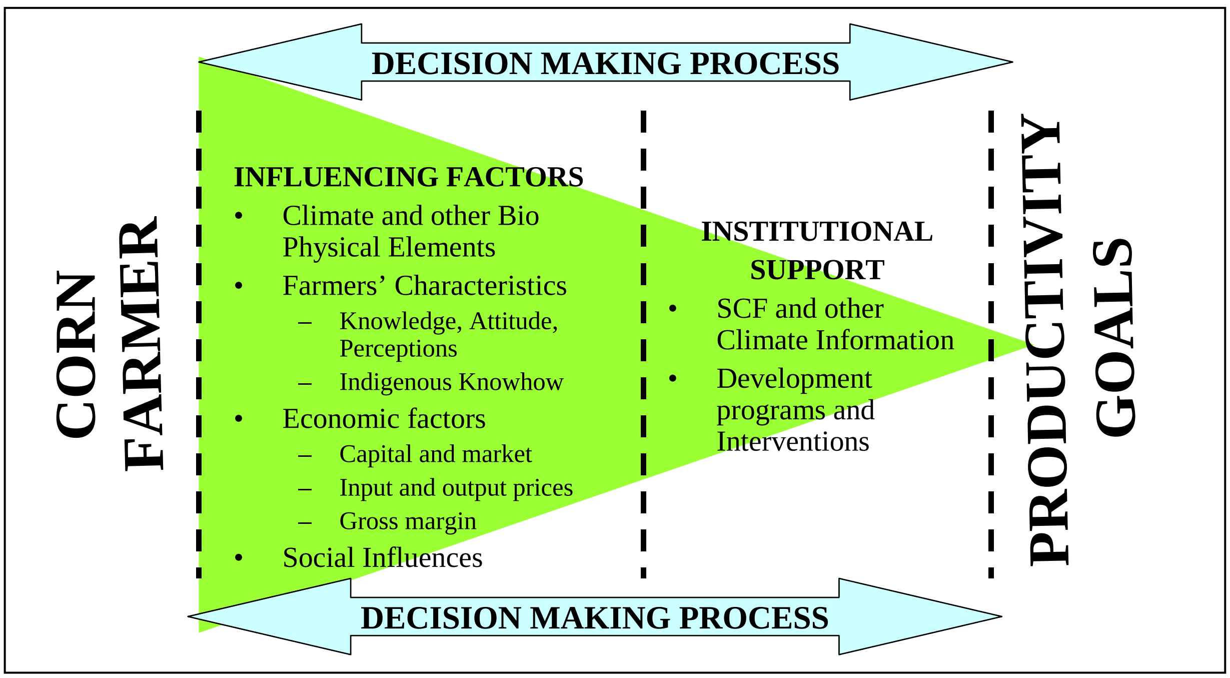



**Figure 1. Conceptual Framework of the Study**

**3.2 Profile of farmer respondents and covered sites.** Echague and Angadanan are among the top corn producing munipalities of Isabela province. They are respectively ranked 3rd and 5th in terms of production and hectarage. The following present the major physical and agronomic attributes of the two municipalities; and the profile of surveyed corn farmers.

**3.2.1_Physical Characteristics of survey sites**. Echague and Angadanan are located in the southern part of Isabela. The physical characteristics of the two municipalities fairly represent the pedo-ecological and agroclimatic features of the province and a substantial part of the Cagayan Valley Region (Region II).

According to the Bureau of Soils and Water Management(BSWM), the corn growing areas of the province belong to only two categories: (1)Warm lowland (<100m elevation, <8%slope, >25$^{o}$C) and (2)Warm cool upland (100-500m elevation, <18%slope, 22.5-25$^{o}$C). Though still with varied topography, Echague is pretty much a typical warm lowland municipality, while Angadanan has both warm lowland and warm-cool upland areas. Topographical classifications of river flood plains, broad plains and hillylands are all present in the two municipalities.

The agroclimatic features of corn producing areas in Isabela belong to two categories: (1) moist and (2) dry. A moist zone receives an annual rainfall of 1500 –to 2500 mm and has an effective crop growing period of 210-270days. A dry zone receives less than 1500 mm per year and has an effective growing period of 90 to 210 days. The classification determines the timing and number of cropping a rainfed farmer can have in a year. Echague has dry to moist conditions, while Angadanan has mostly moist conditions.

**3.2.2 Land use**. Corn-based farmers in Isabela are mostly located along the length of the Cagayan Valley River. Most farms along the zone are rainfed as these areas usually do not have communal or national irrigation facilities. Others use pumps to draw water from the river.

Located along the Cagayan river, Angadanan and Echague are prime corn producing areas with the following corn-based cropping systems: 1.corn+corn, 2.corn+corn+corn, 3.corn+tobacco, 4.corn+corn+watermelon, 5.corn+peanut (BSWM,1995).

Over the years, some changes have occurred on the land use of the two municipalities. But the dominance of corn-based cropping in the area was validated by the farm-level survey. Based on the description of all parcels planted/tilled by farmers, majority were planted to corn (86%). Other parcels were devoted to rice (3%), corn-vegetable (5%), corn-fruit trees (2%), corn-banana (3%), and corn-peanut (1%).

Among the farmers who concentrated on cultivating corn, most planted in monocrop for two croppings a year (83%), while a few fallow the land after a season of cropping (3%).

**3.2.3 Profile of farmer respondents**. A total of 85 corn farmers from the plains and highlands of Echague and Angadanan were interviewed for the farm and household level study.

More than one third (38%) of the respondents were educated only up to the elementary level with many forced to work in the farm early in their lives. The average household size was 4.88.

Twenty one years was the average length of farming experience among those interviewed. The average length as resident of the Barangay is 35.1 years.

One third of the respondents had average monthly income of P6,651.57. The figure included the additional incomes generated by all family members. The rest of the farmers only had seasonal income from farming operations.

**Table 6. Profile of respondents**

| Description | Average |
|---|---|
| Years of farming experience | 20.9 years |
| Farm size | 3.56 hectares |
| Household size | 4.88 persons |
| Years as resident in barangay | 35.1 years |
| Monthly household income* | PhP6,651.57 |

Note: * only 30 respondents disclosed monthly incomes,
the rest only had seasonal income from planting operations

**Table 7.Educational attainment of farmer respondents**

| Educational Level | Frequency | % |
|---|---|---|
| Elementary | 32 | 37.65 |
| High school | 35 | 41.17 |
| Vocational | 5 | 5.88 |
| College | 5 | 5.88 |
| College graduate | 8 | 9.41 |
| Total | 85 | 100 |

Although the average area farmed by each household was computed at 3.56 hectares, more than half of the respondents had farmlands less than 2ha. Twenty-eight percent of the farmers had very small land holdings ranging from 0.3 to 1 ha. Maximum farm size was 30 hectares.

**Table 8. Size of Landholdings among farmers**

| Farm Size (ha) | Frequency | % |
|---|---|---|
| $0 \le 1$ | 23 | 28 |
| $1 \le 2$ | 19 | 23 |
| $2 \le 3$ | 15 | 18 |
| $3 \le 4$ | 5 | 6 |
| $4 \le 5$ | 7 | 8 |
| $5 \le 30$ | 14 | 17 |
| Total | 83 | 100 |

More than half of the farmers (62%) owned the land that they farm. Twenty two percent were renters/lessees and 11% were tenants/shareholders. A few (5%) were mortgage owners (had their lands on mortgage).

Table 9. Tenurial status of farmers, classified by parcels

| Tenurial Status | Number of Parcels | Percentage |
|---|---|---|
| Owner | 104 | 62 |
| Mortgage Owner | 8 | 5 |
| Renter/Lessee | 36 | 22 |
| Tenant/ Shareholder | 19 | 11 |
| Total | 167 | 100 |

In terms of occupation, 97% were primarily dependent on farming. The most common secondary source of income were livestock raising (34%) and driving (12%). The other popular secondary occupations were carpentry (6%), barangay offical (6%), fisherman (5%), store owner (5%) and entrepreneur (5%). Four percent of the respondents only had farming as secondary occupation. Thirty three percent of the farmers had no secondary occupation.

Table 10. Primary and secondary occupations of farmers

| Occupation | Frequency | Percentage |
|---|---|---|
| **Primary Occupation** | | |
| Farmer | 82 | 97 |
| Office Worker | 1 | 1 |
| Vendor | 1 | 1 |
| Teacher | 1 | 1 |
| Total | 85 | 100 |
| **Secondary Occupation** | | |
| No secondary occupation | 29 | 34 |
| Livestock raiser | 28 | 33 |
| Vendor | 3 | 4 |
| Fisherman | 4 | 5 |
| Driver | 10 | 12 |
| Mechanic | 1 | 1 |
| Fishpond owner | 1 | 1 |
| Carpenter | 5 | 6 |
| Painter | 1 | 1 |
| Barangay Official | 5 | 6 |
| Entrepreneur | 4 | 5 |
| Canteen operator | 1 | 1 |
| Sarisari store owner | 4 | 5 |
| Farmer | 3 | 4 |
| Electrician | 1 | 1 |
| Orchard owner | 1 | 1 |

**3.3.4 Cropping patterns.** The traditional start of corn planting seasons in Echague and Angadanan are April-June for wet season cropping and October to December for dry season cropping. Each cropping season lasts for approximately 120 days or 4 months.

The top corn varieties being planted in the province are from the giant corporations of Pioneer, Monsanto and Syngenta. The provincial corn coordinator of Isabela estimated that these three corporations are supplying as much as 70% of the seed requirements of farmers. Biotech corn is also already being planted in the province. Seeds produced by local research institutions (like IPB911) are no longer being planted. Presently, the most common varieties being patronized by farmers are DK818, Pioneer30B80, and TSG81.

The cropping activities of farmers varied with the seasons. The hectarage planted to corn increased during the dry season or October to December planting. The higher average yield of 3.47 MT during this period partly explains the reason for the deviation.

The average size of farm area planted to corn was consistent during the two consecutive wet cropping seasons, indicating that farmers were following a certain set of cultural practices. The average farm sizes planted to corn were 1.51 has during the 2005 wet season and 1.52 has during the 2006 wet season.

**Table 11. Average farm area planted to corn and yield per planting season**

| Description | PLANTING WINDOW | | |
|---|---|---|---|
| | April-June 2005 | October. - December 2005 | April-June 2006 |
| Average farm size planted to corn (ha) | 1.51 | 1.62 | 1.52 |
| Average corn yield (MT/ha) | 3.21 | 3.47 | |

**3.3.4 Cultural practices.** Cultural practices of corn growers in the area were found to be similar to those practiced in other corn-producing districts. Below are the general cultivation practices employed by local farmers:

- Farmers prepare the land in advance and wait for the coming of rains before starting to plant. Water is critical within two weeks after planting, hence they have to make sure that rainfall would be sustained.
- Planting is done within furrows with an average spacing of 70x25cm.
- Fertilizer application is done twice during the season. Ammonium phosphate (16-20-0) is usually applied basally during planting. Urea is applied as side or top dressing 30-45 days after planting. Hilling-up is done simultaneously with the second fertilizer application.
- Though many suspect that the soil is already acidic, liming is a rare practice among farmers.

- Harvesting is done 110-120 days after planting. Farmers usually wait for good weather before commencing harvest. This is so that the grains/corn seeds will not germinate.
- After harvesting, threshing and drying are done before the grains are sold in the market. A rate of P18-20/sack is usually charged for threshing.
- Plowing in many farms is highly mechanized with the use of tractor. The traditional carabao or cattle is used during planting, fertilizer application and hilling-up. Wage rates for farm workers are fixed. A person is paid P100/day, while a worker with his carabao is paid P200/MAD.

## 3.3 Farmers' knowledge and psychology on seasonal climate information

**3.3.1 Perception on significance of SCF.** Farmers validated the significance of SCF in their agricultural activities. Many believed that SCF serves as guide in decision making (92%) and proper crop management (99%), reduces uncertainty from climate variability (92%), provides info on the seasonal rainfall (93%), and helps predict the possible occurrence of disasters like flooding and landslides (94%).

With 78% of the respondents agreeing that climate variability is a major source of uncertainty in their agricultural production, the value of accurate seasonal climate advisory cannot be overlooked. Sixty Three percent (63%) further responded that SCF should be considered in making crop production management decisions.

**Table 12. Knowledge, perception and attitude of farmers on SCF**

| Statement | Response (%) | | | |
|---|---|---|---|---|
| | Yes | No | Don't Know | Total |
| 1. Climate is the average weather condition in a particular area that prevails over a particular period (e.g. season). | 66 | 14 | 20 | 100 |
| 2. Climate is a major source of uncertainty in agricultural production. | 78 | 15 | 7 | 100 |
| 3. Seasonal climate forecasts (SCFs), which refer to forecasts made prior to the start of a season, would guide farmers' crop production decision making. | 92 | 6 | 2 | 100 |
| 4. SCF is an important information for crop production management decision. | 99 | 1 | - | 100 |
| 5. Accurate SCF has the potential to reduce the uncertainty brought about by climate variability and risk. | 92 | 7 | 1 | 100 |
| 6. SCF should not be taken into account when making decisions in crop production. | 32 | 63 | 5 | 100 |

| Statement | Response (%) | | | |
| --- | --- | --- | --- | --- |
| | Yes | No | Don't Know | Total |
| 7. SCF is useful because it allow us to know the amount and onset of rain in the next season. | 94 | 5 | 1 | 100 |
| 8. SCF may help in predicting the likelihood of Disasters like mudslide, flood or drought. | 94 | 5 | 1 | 100 |

**3.3.2 Sources of climate information among farmers.** The most common sources of climate information among farmers were: Television (93%), radio(88%), co-farmers (51%), agricultural technicians (27%) and newspaper (11%). Only 4% answered that they received information from the local PAGASA station..

**Table 13. Sources of information on climate among farmers**

| Source | Frequency | % |
| --- | --- | --- |
| PAGASA local station | 3 | 4 |
| Radio | 75 | 88 |
| Television | 79 | 93 |
| Indigenous knowledge | 23 | 27 |
| Co-farmer | 43 | 51 |
| Technician | 23 | 27 |
| Ernie Baron | 1 | 1 |
| Newspaper | 9 | 11 |
| None | 1 | 1 |

**3.3.3 Awareness and appreciation on PAGASA climate information products.** PAGASA advisories on ENSO (94%) and tropical cyclone occurrence (85%) were the most received climate information among farmers. Table 10 shows the awareness and perception of farmers on PAGASA's information products.

Among those who received information on El Niño and La Niña, thirty eight percent found them useful, and 24% considered them reliable. Only 11% and 9% considered the forecast not useful and unreliable, respectively. Among the farmers who received tropical cyclone warning, 76% and 67% respectively answered positively on the usefulness and reliability of the information. Only 5% considered it not useful and 6% viewed it unreliable.

Both ENSO and tropical cyclone advisories received excellent marks from almost one fifth of the respondents. Sixteen percent of the farmers considered both information products as vital, while 18% answered that their reliability is excellent.

**Table 14. Awareness on, usefulness and reliabilty of PAGASA climate information products**

| Product | Awareness | Usefulness* | | | | | Reliability** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 |
| **Frequency** | | | | | | | | | | |
| Monthly weather situation and outlook | 16 | 1 | 3 | 3 | 7 | 3 | 2 | 5 | 5 | 5 |
| Annual Seasonal Climate forecast | 16 | 1 | 4 | 6 | 2 | 2 | 1 | 3 | 7 | 4 |
| El Niño/La Niña Advisory | 80 | 9 | 14 | 32 | 14 | 11 | 8 | 22 | 20 | 15 |
| Tropical Cyclone Warning | 72 | 4 | 12 | 27 | 14 | 12 | 5 | 19 | 23 | 15 |
| 10 Day Advisory | 6 | | 1 | 4 | | 1 | | 2 | 2 | 1 |
| Farm Weather Forecast | 4 | | 1 | 1 | | 2 | | 1 | | 2 |
| Phil Agroclimatic Review and Outlook | 2 | | | | | 2 | | | | 2 |
| Press Release on Significant Events | 2 | | | 1 | | 1 | | 1 | | 1 |
| Phil Agri-weather Forecast | 3 | | | 2 | | 1 | | 1 | 1 | 1 |
| Climate impact Assessment Bulletin for Agric | 3 | | | 2 | | 1 | | 1 | 1 | 1 |
| **Percentage (%)** | | | | | | | | | | |
| Monthly weather situation and outlook | 19 | 1 | 4 | 4 | 8 | 4 | 2 | 6 | 6 | 6 |
| Annual Seasonal Climate forecast | 19 | 1 | 5 | 7 | 2 | 2 | 1 | 4 | 8 | 5 |
| El Niño/La Niña Advisory | 94 | 11 | 16 | 38 | 16 | 13 | 9 | 26 | 24 | 18 |
| Tropical Cyclone Warning | 85 | 5 | 14 | 32 | 16 | 14 | 6 | 22 | 27 | 18 |
| 10 Day Advisory | 7 | - | 1 | 5 | - | 1 | - | 2 | 2 | 1 |
| Farm Weather Forecast | 5 | - | 1 | 1 | - | 2 | - | 1 | - | 2 |
| Phil Agroclimatic Review and Outlook | 2 | - | - | - | - | 2 | - | - | - | 2 |
| Press Release on Significant Events | 2 | - | - | 1 | - | 1 | - | 1 | - | 1 |
| Phil Agri-weather Forecast | 4 | - | - | 2 | - | 1 | - | 1 | 1 | 1 |
| Climate impact Assessment Bulletin for Agric | 4 | - | - | 2 | - | 1 | - | 1 | 1 | 1 |

*Usefulness rating: 1-not useful, 2-somewhat useful, 3-useful, 4-highly useful, 5-vital
**Reliability rating: 1-unreliable, 2-somewhat reliable, 3-reliable, 4-excellent

**3.3.4 Sufficiency, correctness and level of satisfaction on received information.** To gauge the value of climate related information being received by farmers, questions on sufficiency and correctness and satisfaction were asked. Fifty five percent (55%) said that the information were sufficient; 72% believed the advisories were accurate and 61% professed their satisfaction with the information.

Although majority answered positively, a significant number of farmers still voiced out discontent on the sufficiency of information(44%), correctness of content(28%) and level of satisfaction (39%).

**Table 15. Farmers' perception on climate information received**

| Response | Sufficiency | | Correctness | | Satisfaction | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Yes | 47 | 55 | 61 | 72 | 52 | 61 |
| No | 37 | 44 | 24 | 28 | 33 | 39 |
| No answer | 1 | 1 | 0 | 0 | 0 | 0 |
| Total | 85 | 100 | 85 | 100 | 85 | 100 |

Note: ‘yes’ includes answers like 'it depends' and 'sometimes'

**3.3.5 Relevance of climate related information**. All interviewed farmers stated that climate related information were relevant to crop production operations. One hundred percent (100%) answered positively with 45% stressing that climate-related information were very relevant.

**Table 16. Relevance of climate-related information**

| Response | Frequency | % |
|---|---|---|
| Very relevant | 38 | 45 |
| Relevant | 34 | 40 |
| Moderately relevant | 13 | 15 |
| Not relevant | 0 | 0 |
| Total | 85 | 100 |

**3.3.6 Farmers’ perception on reliability of seasonal rainfall.** Thirty percent of the respondents aired uncertainty over the reliability of seasonal rainfall in meeting their cropping needs. Forty percent said that rainfall was reliable, and 21% responded it was somewhat reliable. Still, majority of farmers believed that seasonal rainfall is sufficient to meet crop requirements.

**Table 17. Farmers’ perception on reliability of rainfall**

| Response | Frequency | % |
|---|---|---|
| Very reliable | 6 | 7 |
| Reliable | 34 | 40 |
| Somewhat reliable | 18 | 21 |
| Unreliable | 18 | 21 |
| Somewhat unreliable | 8 | 9 |
| No answer | 1 | 1 |
| Total | 85 | 100 |

**3.3.7 Frequency of droughts as perceived/experienced by farmers.** It is quite alarming that majority of the farmers were experiencing more frequent bouts of prolonged dry spells over the past years. Forty One percent (41%) of the farmers said that drought occurred every two years, while 28% claimed they were experiencing the problem almost yearly.

**Table 18. Frequency of droughts as perceived/ recalled by farmers**

| Response | Frequency | % |
|---|---|---|
| Every 2-3 months | 2 | 2 |
| Every semester | 4 | 5 |
| Yearly | 24 | 28 |
| Every 1 ½ year | 1 | 1 |
| Every 2 years | 35 | 41 |
| Every 3 years | 10 | 12 |
| Every 5 years | 3 | 4 |
| Every 7 years | 1 | 1 |
| Every 10 years | 3 | 4 |
| Every 3 consecutive years | 1 | 1 |
| No pattern | 1 | 1 |
| Total | 85 | 100 |

**3.3.8 Perceived impact of seasonal rainfall on crop production.** Majority of farmers validated the significant impact of seasonal rainfall on crop production. Forty Eight percent (48%) stated that the impact was medium in intensity, while 24% claimed it was major or high. Only 21% answered that seasonal rainfall impact was minimal.

**Table 19. Impact of seasonal rainfall on crop production**

| Response | Frequency | % |
|---|---|---|
| Major or high | 21 | 24 |
| Medium | 41 | 48 |
| Low impact | 5 | 6 |
| Minimal | 18 | 21 |
| Total | 85 | 100 |

**3.3.9 Attitude towards risk.** Majority of the interviewed corn farmers were conservative in their farming activities. Sixty five percent preferred low-but-assured-yield over a high-risk-high-profit alternative. When asked whether they were willing to take risks for higher earnings, most preferred average returns in exchange for lower risks or favorable cropping conditions.

Table 20. Risk Averse vs. Risk taker: stand of farmers on taking risks in farm operations

| Response | Frequency | % |
|---|---|---|
| Risk Averse | 55 | 65 |
| Risk Taker | 30 | 35 |
| Total | 85 | 100 |

## 3.4 Key production decisions influenced by climate

**3.4.1 Major factors considered by farmers in crop production.** Climate information was second only to capital in terms of factors considered by farmers in their crop production operations. Ninety Two percent (92%) replied that capital is their number one concern, with climate information coming in a close second (76%).

The other factors being considered by farmers were cost of inputs (69%), selling price of produce (69%), corn variety (4%), and activities of other farmers (1%).

Table 21. Major considerations in crop production among farmers

| Considerations in Crop Production | Frequency | % |
|---|---|---|
| Capital | 78 | 92 |
| Climate information | 65 | 76 |
| Cost of inputs | 59 | 69 |
| Selling price of produce | 58 | 68 |
| Corn variety | 3 | 4 |
| Activity of other farmers | 1 | 1 |

**3.4.2 Key production decisions as influenced by climatic variability and SCF.** Farmers were in consensus about the significance of climate variability and seasonal climate advisory in on-farm decision making processes.

The respondents stated that the decisions on the following were affected by climate variability: capital (66%), type of crop (72%), timing of planting (69%), cost of inputs (28%), and selling price of produce (1%).

On the influence of SCF in general farm production operations, decision-making on the following were affected: capital (62%), crop to plant (60%), timing of planting (56%), cost of inputs (4%), and selling price of produce (1%).

The influences of SCF specifically on corn production were manifested in farmers' decisions on corn variety (78%), levels of inputs applied (62%), capital (4%) and timing of planting (1%). It is important to note that though majority of farmers respectively claimed that time of planting is affected by climate variability (69%) and generally influenced by SCF(56%), for corn production, the timing of planting was not subject to received climate information with only 1% professing such influence.

**Table 22. Key production decisions as influenced by climatic factors**

| Key Decision | Affected by Climate Variability | | Influenced by SCF in Farm Prod'n | | Influenced by SCF in Corn Prod'n | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Level of capital | 56 | 66 | 53 | 62 | 3 | 4 |
| Cost of inputs | 24 | 28 | 3 | 4 | - | - |
| Selling price of produce | 1 | 1 | 1 | 1 | - | - |
| Corn variety | - | - | - | - | 66 | 78 |
| Crop to plant | 61 | 72 | 51 | 60 | - | - |
| Timing of planting | 59 | 69 | 48 | 56 | 1 | 1 |
| Levels of inputs applied | - | - | - | - | 53 | 62 |

## 3.5 Climate variability and indigenous knowledge and mitigating measures

**3.5.1 Crop losses experienced by farmers.** Ninety four percent of the respondents had already experienced losing their crop to climatic variabilities like droughts, floods and typhoons. Only 6% responded otherwise. The numbers highlight the great risks faced by farmers in growing corn.

**Table 23. Farmers who had experienced crop failure due to climatic variability**

| Response | Frequency | % |
|---|---|---|
| Experienced crop failure | 80 | 94 |
| Did not experience crop failure | 5 | 6 |
| Total | 85 | 100 |

**3.5.2 Coping measures in the event of crop failure.** Most of the farmers had a resigned attitude when it came to mitigating the adverse effects of climatic abnormalities. Among those who suffered from crop failure, 67% believed that nothing could have been done to prevent the loss but to just accept the fortuitous event. Others tried to cope by replanting the damaged crop (18%) and planting alternate crops like mongo and sweet potato(9%). The rest of the answers included applying chemical sprays (5%), praying to God(2%), and adopting measures like crop insurance and building dikes for floods. A farmer even tried other livelihood options like driving utility vehicles just to get by.

**Table 24. Coping measures adopted by farmers in case of crop failure**

| Response | Frequency | % |
|---|---|---|
| No strategy/believes nothing can be done but to accept loss | 57 | 67 |
| Replanting (same crop) | 15 | 18 |
| Plant alternate crops like Mongo, white corn, sweet potato | 8 | 9 |
| Chemical spray | 4 | 5 |
| Prayers | 2 | 2 |
| Do early harvest if still possible | 1 | 1 |
| Establish dike to avoid flooding | 1 | 1 |
| Engage in other livelihood activity like driving | 1 | 1 |
| Feed destroyed crops to livestock | 1 | 1 |
| Get crop insurance | 1 | 1 |
| Action depends on weather | 1 | 1 |
| No answer | 1 | 1 |

**3.5.3 Indigenous/traditional forecasting methods.** Interviewed farmers enumerated a long list of indigenous indicators regarding the overall theme of the coming seasons.

To predict the coming of rains, local folks looked for a variety of signs ranging from the appearance of heavenly bodies (moon,stars,sun,clouds); behavior of local fauna (insects, birds and farm animals); and the performance of local flora (flowering of orchids and grass, fruiting of trees).

**Table 25. Indigenous indicators of rainy/dry season**

| Response | Frequency | % |
|---|---|---|
| **Signs indicating rains will come:** | | |
| • Moonless night | 2 | 2 |
| • Cloudy and dim sky | 6 | 7 |
| • Dragonflies /play/fly at low altitude | 3 | 4 |
| • Stars are twinkling | 1 | 1 |
| • Two months without rain | 1 | 1 |
| • Presence of potholes in the riverbanks | 1 | 1 |
| • Duck going to the roof of the house and showing their wings | 2 | 2 |
| • Crescent shaped moon is like letter C | 7 | 8 |
| • Earthworm rolling over dust | 1 | 1 |
| • Small birds fly together at low altitude | 1 | 1 |
| • Clouds are like cultivated land | 1 | 1 |
| • Moon's shape is undesirable | 3 | 4 |
| • Moon is oriented sideways | 2 | 2 |
| • Moderate weather for planting season if it rains on the first day of the year | 1 | 1 |
| • Warm weather signals rains | 1 | 1 |
| • If stars look too near each other | 1 | 1 |
| • Flowering of talahib grass | 2 | 2 |
| • Few fruits of fruit trees signals excessive rains | 1 | 1 |

| Response | Frequency | % |
|---|---|---|
| • Pigs playing and poultry nesting early signal typhoon | 2 | 2 |
| • Dogs defecate in the middle of the street | 3 | 4 |
| • Clouds are color orange | 2 | 2 |
| • Thunder is present | 1 | 1 |
| • Ants hoard their food | 1 | 1 |
| • Ants carry eggs and food to a certain direction, there will be floods | 3 | 4 |
| • Earthworms emerge from ground | 1 | 1 |
| **Drier conditions are to be expected when:** | | |
| • Crescent shaped moon is like a container catching dripping water | 5 | 6 |
| • When the earth cracks | 1 | 1 |
| • Moon is oriented center | 2 | 2 |
| • Native orchids flower | 1 | 1 |
| • Fruit harvests are good | 1 | 1 |
| • Bright sun during mornings | 1 | 1 |
| • Moon is unusually bright | 1 | 1 |

**3.5.4 Perceived reliability of traditional forecasting techniques**. Interestingly, more farmers believed in the reliability of traditional means of weather/climate forecasting. Only 25% voiced out that the methods were unreliable. The rest found the indigenous means reliable (32%), somewhat reliable (4%) and very reliable (6%).

**Table 26. Reliability of traditional forecasting methods as Perceived by farmers**

| Response | Frequency | % |
|---|---|---|
| Reliable | 27 | 32 |
| Very reliable | 5 | 6 |
| Somewhat reliable | 3 | 3 |
| Unreliable | 21 | 25 |
| Not applicable | 18 | 21 |
| No answer | 11 | 13 |
| Total | 85 | 100 |

**3.5.5 Superstitious beliefs among farmers.** More than half (64%) of the interviewed farmers did not believe in good luck/ bad luck when making on-farm decisions. However, 35% still conformed to old sayings and beliefs when it came to planting.

Among those who believed in good luck/bad luck, majority followed a set of preferred dates and days. Five percent believed that Tuesdays and Fridays were unlucky, 5% thought that number ‘8’was good luck, and 2% thought planting during Sundays, holyweek and ‘Lunes de Hudas’ were unlucky. The rest looked for other favorable signs like the appearance of the moon and presence of insects and practiced special rituals supposedly to make the crop more productive.

Though some farmers were still practicing certain cultural peculiarities, majority already followed more modern ways of planting corn. This implies that the group may be open to more technological interventions in the future.

**Table 27. Farmers believing in good luck or bad luck when deciding on and commencing farm operations**

| Description | Frequency | % |
|---|---|---|
| Believes in good luck/bad luck | 30 | 35 |
| Does not believe in good luck/bad luck | 54 | 64 |
| No answer | 1 | 1 |
| Total | 85 | 100 |

**Table 28. Good luck/ Bad luck beliefs and practices among farmers**

| Belief/ Practice | Frequency | % |
|---|---|---|
| Place unbroken comb on seeds so they will grow equally well | 1 | 1 |
| If moon appears, corn will grow well/ fullmoon is lucky | 2 | 2 |
| Nothing will be harvested during new moon | 1 | 1 |
| Numbers 11 and 22 are unlucky dates | 1 | 1 |
| Wednesdays and Saturdays are lucky days to plant | 1 | 1 |
| Tuesdays and Fridays are unlucky | 4 | 5 |
| Never plant on Monday-Lunes de Hudas | 2 | 2 |
| Number 25 on calendar is unlucky | 1 | 1 |
| Cowlick on the sole of carabao's feet is good luck | 1 | 1 |
| When planting, don't look back to avoid replanting | 1 | 1 |
| Good luck to plant first seed with chicken beak | 1 | 1 |
| May 8 is a lucky day to plant/ 8 is good luck | 4 | 5 |
| Broken plow is unlucky | 1 | 1 |
| Numbers 7, 8 and 5 are lucky dates | 1 | 1 |
| Numbers by 5 (5,10,15,20,25,30) are lucky dates | 1 | 1 |
| Number 27 is a lucky date | 1 | 1 |
| Scorpions bring luck | 1 | 1 |
| Bad luck to cultivate during Sunday and holy week | 2 | 2 |
| Bad luck to work during the end of the month | 1 | 1 |
| Bad luck to plant during Fiesta of the patron saint | 1 | 1 |

**3.5.6 Indigenous mitigating measures against drought, floods and typhoons.** Farmers enumerated several ways of coping with the destruction brought about by drought, floods and typhoons.

Some of the mentioned indigenous ways of countering drought and floods were planting trees, establishing waterways, and planting on riverbanks and waterways. Prayer was the only resort for many. Most farmers were resigned to the fact that not much intervention could be done when such calamities strike.

Modern ways utilized to counter drought included the use of water pump (20%) and establishment of supplemental irrigation (4%). To control flooding, some farmers used contouring and drainage canals.

The very limited options and interventions aired by farmers indicate openings for development interventions. Appropriate agricultural technologies to counter drought and flooding could be made available to local corn growers.

**Table 29. Mitigating measures adopted by farmers against climatic disasters**

| Event | Indigenous Measures | | | Modern Interventions | | |
|---|---|---|---|---|---|---|
| | Intervention | Frequency | % | Intervention | Frequency | % |
| **Drought** | Plant trees | 3 | 4 | Use water pump | 17 | 20 |
| | Planting banana, cassava, mongo | 1 | 1 | Establish irrigation | 3 | 4 |
| | Manual watering | 1 | 1 | | | |
| **Flood** | Plant trees | 2 | 2 | Drainage canals | 3 | 4 |
| | Planting on Riverbanks | 1 | 1 | Contouring | 1 | 1 |
| | Planting on waterways | 1 | 1 | | | |
| | Establish waterways | 1 | 1 | | | |
| **Typhoons** | Early preparation | 1 | 1 | | | |
| | Planting of trees | 1 | 1 | | | |

## <u>3.6 Farmers' practices and level of farm productivity</u>

**3.6.1 Importance of climate information to farming enterprise.** Ninety Eight percent (98%) of farmers used climate/weather information in their planning and decision-making activities. Only 1% mentioned otherwise.

Most of the respondents considered climate/weather information to be significant in their farming enterprises. Forty Eight percent (48%) claimed moderate significance, while 46% responded high significance. Only 2% viewed such information to have low importance in their agricultural livelihood.

**Table 30.Use of climate/weather information and significance in farming enterprise**

| Response | Frequency | % |
|---|---|---|
| **Use in planning and decision making** | | |
| Yes | 83 | 98 |
| No | 1 | 1 |
| it depends | 1 | 1 |
| Total | 85 | 100 |
| | | |
| **Significance to the farming enterprise** | | |
| High | 39 | 46 |
| Medium | 41 | 48 |
| Low | 2 | 2 |

**3.6.2 Indicators used by farmers when commencing key farm activities.** Interviewed farmers used an array of indicators when deciding on key production operations like land preparation, planting and harvesting. Most of those interviewed synchronized the cropping season with the coming of rains. Fifteen percent and 33% respectively commenced land preparation and corn planting when it started raining. Eleven percent of the farmers followed the May-June and October to November planting seasons. Nine percent also conformed to seasonal schedules when doing planting operations.

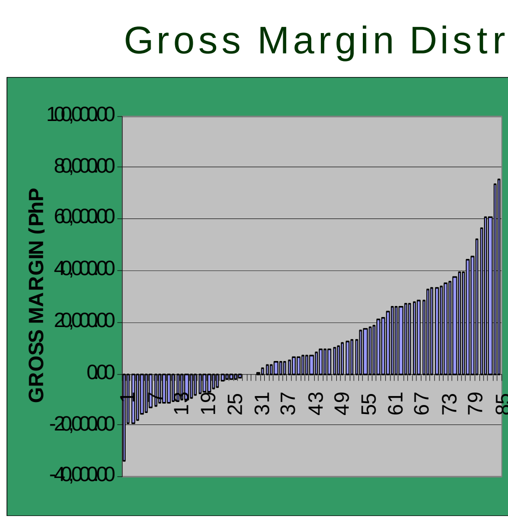
Some farmers wanted to ensure enough moisture for the growing crop by delaying the planting schedule until the land was wet enough (7%), and after witnessing several successive rainfalls (5%). Still, others gave more weight to preferred dates of the month/year when starting farm work (2%).

When it came to harvesting, many (24%) followed the 110-120 maturity period of the corn crop. Others waited for the corn ears to dry-up (6%) and preferred to harvest when the weather is dry/moderate(12%).

**Table 31. Indicators/signs used by farmers when commencing land preparation, planting and harvesting**

| Indicators/ Signs | Land Preparation | | Planting | | Harvesting | |
|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % |
| When it starts raining | 13 | 15 | 28 | 33 | 0 | 0 |
| By season or months of April-May-Jun and Oct-Nov | 12 | 14 | 8 | 9 | 6 | 7 |
| When grasses are already tall/grow a certain length | 2 | 2 | 0 | 0 | 0 | 0 |
| Favorite/ preferred dates and days | 1 | 1 | 2 | 2 | 0 | 0 |
| Presence of clouds signaling rains | 2 | 2 | 2 | 2 | 0 | 0 |
| When land is wet enough and already soft | 2 | 2 | 7 | 8 | 0 | 0 |
| When other farmers start their operation | 2 | 2 | 1 | 1 | 0 | 0 |
| When the soil/land is hard | 2 | 2 | 0 | 0 | 0 | 0 |
| After harvesting | 5 | 6 | 0 | 0 | 0 | 0 |
| After the second rain of the season | 2 | 2 | 1 | 1 | 0 | 0 |
| After successive rains/ signifying enough rainfall | 1 | 1 | 4 | 5 | 0 | 0 |
| 3-4 days after rains started | 0 | 0 | 1 | 1 | 0 | 0 |
| When the Talahib grass flowers | 1 | 1 | 0 | 0 | 0 | 0 |
| After praying | 0 | 0 | 1 | 1 | 0 | 0 |
| Presence of crickets | 1 | 1 | 0 | 0 | 0 | 0 |
| Presence of rainbow | 2 | 2 | 0 | 0 | 0 | 0 |
| If there is no moon | 0 | 0 | 1 | 1 | 0 | 0 |
| When there's a bit of sun | 1 | 1 | 0 | 0 | 0 | 0 |
| When there is moderate weather with no rain | 0 | 0 | 0 | 0 | 10 | 12 |
| When corn ears are all dried up | 0 | 0 | 0 | 0 | 5 | 6 |
| After visual assessment | 0 | 0 | 0 | 0 | 1 | 1 |
| After110-120 days | 0 | 0 | 0 | 0 | 20 | 24 |
| If it is dry season already | 1 | 1 | 0 | 0 | 1 | 1 |
| Presence of scorpions | 1 | 1 | 1 | 1 | 1 | 1 |
| Activities depend on the crop variety | 0 | 0 | 0 | 0 | 2 | 2 |

**3.6.4 Costs and returns in corn farming.** The average net return or gross margin per hectare in corn farming was computed at ₱ 18,072.85. Farmers who availed of credit through local financiers got even less at ₱12,651.00/ha.




| GROSS MARGIN (RANGE) | FREQUENCY (#) | PERCENTAGE (%) |
|---|---|---|
| <0 | 29 | 34.12 |
| 0≤1000 | 2 | 2.35 |
| 1000≤2000 | - | - |
| 2000≤3000 | 1 | 1.18 |
| 3000≤4000 | 2 | 2.35 |
| 4000≤5000 | 3 | 3.53 |
| 5000≤6000 | 1 | 1.18 |
| 6000≤7000 | 2 | 2.35 |
| 7000≤8000 | 4 | 4.71 |
| 8000≤9000 | - | - |
| 9000≤10000 | 3 | 3.53 |
| 10000≤11000 | 2 | 2.35 |
| 11000≤12000 | 1 | 1.18 |
| 12000≤13000 | 1 | 1.18 |
| 13000≤14000 | 2 | 2.35 |
| 14000≤15000 | - | - |
| 15000≤16000 | - | - |
| 16000≤20000 | 4 | 4.71 |
| 20000≤25000 | 3 | 3.53 |
| 25000≤30000 | 8 | 9.41 |
| >30000 | 17 | 20.00 |
| TOTAL | 85 | 100.00 |
| MEAN GROSS MARGIN = PhP 12,191 | | |

Production costs consisted of labor costs for farm activities, tractor rental for land preparation, post harvest expenses like threshing, and material inputs like fertilizer, pesticide, herbicide and seeds. Labor from family and community bayanihan were not included in the computation. All other inputs were averaged given the answers of the 85 farmer respondents. Grain sales were computed using an average yield of 3,471kg/ha and price of ₱9.36/kg.

**Table 32. Costs and returns per hectare in corn farming in Echague and Angadanan, Isabela**

| Item | Amount in PhP | Total |
|---|---|---|
| **Returns** | | |
| Average yield (3471 kg/ha) | | |
| Gross sales at P9.36/kg | 32,488.56 | |
| **Total returns** | | **32,488.56** |
| **Costs** | | |
| Seed | 2,883.56 | |
| Fertilizer | | |
| Urea (46-0-0) | 3,494.80 | |
| Complete (14-14-14) | 874.19 | |
| Ammonium Phosphate (16-20-0) | 2,537.94 | |
| Herbicide | 347.54 | |
| Pesticide | 341.74 | |
| Labor | | |
| Man-days (at ₱ 100/MD) | 2,377.53 | |
| Man-animal days (at ₱ 200/MAD) | 812.74 | |
| Tractor | 745.67 | |
| **Total Costs** | | **14,415.71** |
| **Net Returns (Gross Margin)** | | **18,072.85** |
| Less 30% interest on credit (for farmers with financiers) | 5,421.86 | |
| **Gross Margin less interest on credit** | | **12,651.00** |

Note: Values used are averages from the responses of 85 farmers from Angadanan and Echague, Isabela

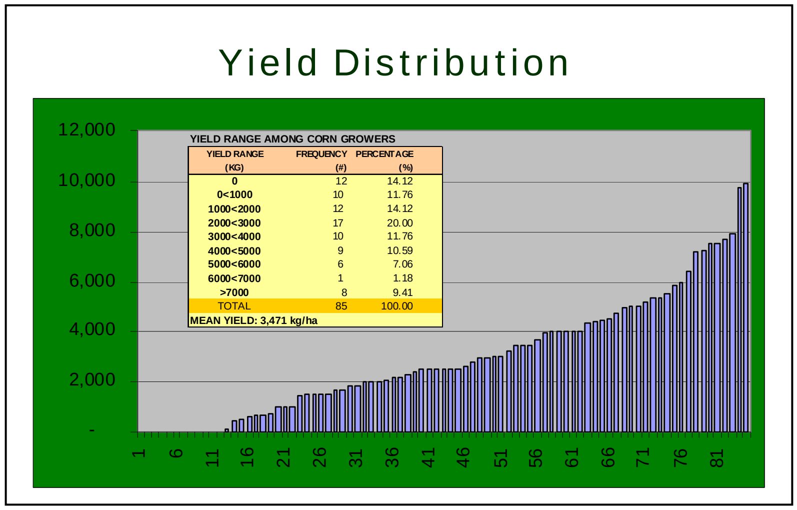
**3.6.5 Cross tabulations on key productivity indicators.** Key productivity indicators were analyzed against farm size and farm location to look for possible explanations in recorded differences. Yield ranges, gross sales, production cost, and gross margin were cross tabulated against farm size and geographical location.

Results showed that at .05 level of significance, corn yield and gross sales are both significantly correlated to location by Barangay and Municipality; and gross margin is significantly correlated to farm size (Table 34).

Table 33 and Appendix Tables 1-6 present the details of the cross tabulations.

**3.6.5.1 Yield vs location and farm size**. Overall, dry season yields averaged at 3.47MT per hectare, ranging from a low of zero to a high of 9900kg. Forty six percent (46%) of the farmers in the two municipalities had yields lower than the 3000kg mark. Forty one percent got yields higher than 3000kg, with 11% getting impressive production of more than 6000MT/ha.

Yields in the upland barangays of La Suerte, Rang-ayan, Narra and Pagasa were lower than yields recorded from the broad and flood plains of Duroc, Pissay, Annafunan and Dugayong. Average yields for the upland barangays ranged from 2.33MT/ha to 3.42MT.ha. Low land barangays had average yield ranges of 3.63MT to 5.48MT.




Numbers were substantially higher in the Barangays of Echague, Isabela, with more than half(62%) of the farmers registering a yield of more than 3000kg. Only 18% of Echague farmers received yields less than 3000kg, compared to Angadanan farmers where 27% got below average performance. The average yield for Echague was 3.93MT, while Angadanan had 3.07MT.

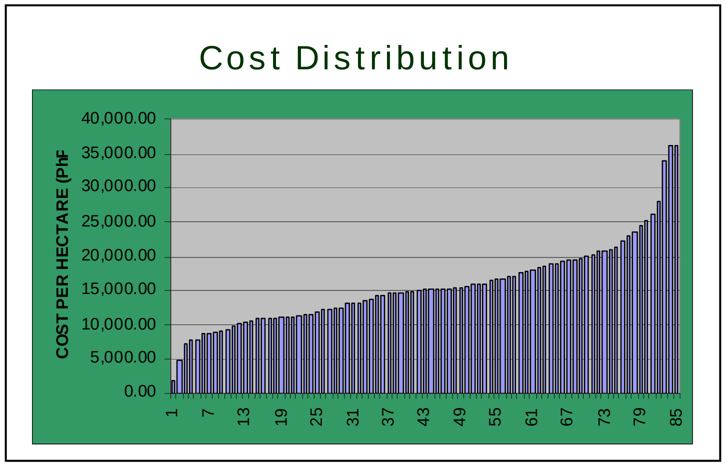
Yield seemed to have favored farmers with lesser farm sizes. Figures for farms less than 2ha were comparable to those of bigger farms, but the highest average yields were from farms less than 1ha in size. In fact, 8 out of the 11 farmers with yields greater than 6000kg had only less than 3 hectares of farm land.

**3.6.5.2 Gross sales vs location and farm size.** Gross sales per hectare averaged at P32,490.25, ranging between zero to P90,000.00. Seventy two percent of the farmers had gross sales of less than P50,000.00, while 20% received figures between P20,000-30,000.00 (Appendix Tables 1-6).

Grain sales varied by location with farmers from Echague gaining the upperhand from their counterparts in Angadanan. Twenty percent (20%) of Echague farmers obtained sales of more than P40,000.00, while only 7% of Angadanan farmers had comparable returns. This may be because gross sale is reflective of the yield level.

Surprisingly, extreme values were recorded for farmers with less than 3 hectares of land. Both extremely low and extremely high values were given by respondents from this group, with 25% logging sales higher than P30,000.00 and 33% getting much lower returns. None of the farmers with more than 3ha of farmland got sales higher than P60,000.00—the 8% who registered extremely high values all came from the low farm size group.

**3.6.5.3 Production cost vs location and farm size.** Total cost per hectare averaged at 14,415.71 for all the respondents. Eighty five percent had per hectare production costs of less than P20,000.00.




More than half (59%) of the farmers registered production costs of less than P15,000 per hectare, with 39% incurring expenses between P10,000 to P15,000. Twenty six percent said that they spent around 20,000 per hectare, while the remaining 15% claimed to have spent more.

Production costs did not vary much by location as figures from Echague and Angadanan farmers were comparable. Flood plains and hilly lands have average per hectare costs of around P13,000.00. Broad plains have a higher average cost at P17,524.43/ha, possibly reflective of the more intense corn cultivation in these areas.

In terms of farm size, 10% of the 13% who claimed to have spent more than P20,000/ha on direct inputs belonged to the group with less than 3 hectares of farmland. Costs ranged from a low of P10,189.21/ha to a high of P23,848.26/ha.

**3.6.5.4 Gross margin vs location and farm size.** Gross margin proved variable given differences in farm size. Forty one percent (41%) of the respondents had gross margins of more than P15,000. Twenty two percent (22%) recorded an impressive figure of more than P30,000 per hectare (Appendix Table 1-6). The average gross margin for all the interviewed farmers was P13,487.69/ha.

Gross margin values per hectare seemed higher for farmers with smaller lands. Twenty eight percent of the respondents, all with less than 3ha of farmland, gave gross margin values of greater than 15,000. Only 10% of the farmers with this gross margin range came from farmers with bigger land holdings (3-10<ha).

On the other hand, 37% of small land holders and 21% of big land owners disclosed gross margin figures of less than P15,000. Computed average grossmargin for farms less than or equal to .5ha in size was P31,615.82. Values generally decreased as farm size increased, even reaching a negative low of (P1,095.46 net loss) for farms 5-10ha in size. Farms around 3ha in size received a respectable average gross margin of P19,624.13.

In terms of location, Angadanan and Echague registered similar numbers with 19% of the former and 21% of the latter claiming gross margins of more than P15,000.00 per hectare. Of the 40% high performing farmers, 29% were from the lowland barangays of Duroc, Pissay, Annafunan and Dugayong. The average returns for Echague were a bit higher than figures from Angadanan. Echague had an average gross margin of P15,387/ha, while Angadanan had only P11,717.49/ha.

**3.6.5.5 Lowland vs. Upland Farms.** Among the covered sites, broad and flood plains comprise the lowland corn producing areas, while rolling and hilly lands make up the upland farms. The villages of Duroc, Pissay, Annafunan and Dugayong are predominantly lowland, while Rang-ayan, La Suerte, Narra and Pagasa are generally upland.

Comparative analysis showed that lowland farmers have an edge over their upland counterparts. In all observed productivity indicators, higher figures were recorded among farmers from broad and flood plains, with the former showing the highest figures among all topographical classifications.

In terms of yield, of the 41% who got figures above 3MT, 31% were from lowlands while only 10% were from upland farms (Appendix Table 1-6). Broad plains had an average yield of 4.5MT, while flood plain and hillyland had respective yields of 3.7MT and 2.5MT (Table 29).

On gross sales, of the 37% who got exceptionally high figures of above P30,000, 29% were from lowlands while 8% were from upland farms.

Among those who incurred production costs of more than 15,000 per hectare, 24% were from upland farms, while only 17% were from lowlands. Input costs still seemed higher for upland areas. On average, broad plains had the highest cost per hectar at P17,524.43. The high cost is, however, offset by greater productivity.

Considering gross margin, lowland farms still had the edge. Of the 36% who got net returns of more than P15,000 per hectare, 30% were from lowland farms while only 6% came from upland farms. Gross margin was highest in broad plains with an average of P22,536.5/ha. Flood plains had a gross margin average of P17,718.98/ha, while hilly lands had only P5,134.19/ha.

**3.6.5.7 Tenurial status vs. productivity indicators.** Considering the tenurial status of farmers, the productivity of tenants/shareholders proved higher than those of owners, mortgage owners and renters/lessees. With an average yield of P5,251.00 and average gross margin of P26,811.02, tenants or shareholders bested all others in the productivity race.

Yields of farmers classified under other tenure status registered much lower figures. Average yields for these farmers were close to the provincial average of 3.11MT. Land owners had an average yield of 3.3MT, mortgage owners had 3.0MT, and renters/lessees had 3.3MT.

Tenants also had lower costs per hectare averaging at P11,414.88. This is much smaller than the figures disclosed by land owners (P14,730.06 ), mortgage owners (18,450.00 ) and renters/lessees(14,694.57).

**Table 33. Mean values of cross tabulated productivity indicators**

| ITEM | MEAN VALUES | | | |
|---|---|---|---|---|
| | Yield (kg./ha.) | Gross Sales (PhP/ha.) | Cost (PhP/ha.) | Gross Margin (PhP/ha.) |
| **TOPOGRAPHY** | | | | |
| Flood Plain | 3,722 | 34,842.62 | 13,103.34 | 17,718.98 |
| Broad Plain | 4,484 | 41,968.23 | 17,524.43 | 22,536.15 |
| Hilly Land | 2,539 | 23,761.22 | 13,489.47 | 5,134.19 |
| Total | 3,471 | 32,490.25 | 14,415.71 | 13,487.69 |
| **BARANGAY** | | | | |
| Duroc | 3,995 | 37,389.30 | 12,442.59 | 20,792.34 |
| La Suerte | 2,548 | 23,853.82 | 15,377.42 | 6,488.58 |
| Pissay | 3,634 | 34,018.02 | 11,452.40 | 19,473.08 |
| Rang-ayan | 2,332 | 21,824.40 | 15,156.04 | 3,030.96 |
| Annafunan | 3,706 | 34,691.41 | 16,004.69 | 11,748.44 |
| Dugayong | 5,484 | 51,333.88 | 18,836.95 | 32,496.94 |
| Narra | 3,420 | 32,012.07 | 12,771.52 | 13,420.18 |
| Pag-asa | 2,639 | 24,697.03 | 13,207.07 | 4,080.85 |
| Total | 3,471 | 32,490.25 | 14,415.71 | 13,487.69 |
| **MUNICIPALITY** | | | | |
| Angadanan | 3,068 | 28,716.17 | 13,735.48 | 11,717.49 |
| Echague | 3,934 | 36,819.35 | 15,145.70 | 15,387.42 |
| Total | 3,471 | 32,490.25 | 14,415.71 | 13,487.69 |
| **FARM SIZE (HA)** | | | | |
| ≤0.5 | 4,466 | 41,805.03 | 10,189.21 | 31,615.82 |
| 0.5≤0.9 | 4,968 | 46,499.79 | 23,848.26 | 22,651.53 |
| 1 | 3,588 | 33,579.00 | 12,763.08 | 18,232.92 |
| 1.5 | 3,048 | 28,530.32 | 13,964.00 | 11,713.29 |
| 2 | 3,085 | 28,877.33 | 16,550.44 | 12,326.89 |
| 2≤2.5 | 3,961 | 37,076.00 | 15,506.06 | (675.66) |
| 2.5≤3 | 3,924 | 36,725.00 | 13,428.38 | 19,624.13 |
| 3≤4 | 3,958 | 37,050.00 | 16,305.44 | 5,924.56 |
| 4≤5 | 2,727 | 25,527.84 | 14,178.67 | 7,702.34 |
| 5≤10 | 3,044 | 28,496.00 | 14,459.14 | 8,855.77 |
| >10 | 1,712 | 16,026.40 | 13,115.26 | (1,095.46) |
| Total | 3,471 | 32,490.25 | 14,415.71 | 13,487.69 |
| **TENURE STATUS** | | | | |
| Owner | 3,272 | 30,629.27 | 14,730.06 | 11,146.39 |
| Mortgage owner | 3,000 | 28,080.00 | 18,450.00 | 9,630.00 |
| Renter/Lessee | 3,331 | 31,177.58 | 14,694.57 | 14,649.03 |
| Tenant | 5,251 | 49,147.58 | 11,414.88 | 26,811.02 |
| Total | 3,471 | 32,490.25 | 14,415.71 | 13,487.69 |

Note: Rang-ayan, La Suerte, Narra and Pagasa and predominantly upland areas, while Duroc, Pissay, Annafunan and Dugayong are broad and flood plains.

**Table 34. Symmetric Measures of significance**

| Nominal by Nominal Contingency Coefficient | Valid Cases | Value | Approximate Significance |
|---|---|---|---|
| Yield vs Municipality | 73 | 0.408 | 0.024 * |
| Yield vs Barangay | 73 | 0.699 | 0.005 * |
| Yield vs Farm Size | 73 | 0.668 | 0.516 |
| Gross Sales vs Municipality | 73 | 0.480 | 0.005 * |
| Gross Sales vs Barangay | 73 | 0.734 | 0.007 * |
| Gross Sales vs Farm Size | 73 | 0.759 | 0.073 |
| Cost vs Municipality | 85 | 0.227 | 0.594 |
| Cost vs Barangay | 85 | 0.562 | 0.590 |
| Cost vs Farm Size | 85 | 0.674 | 0.161 |
| Gross Margin vs Municipality | 85 | 0.260 | 0.521 |
| Gross Margin vs Barangay | 85 | 0.604 | 0.479 |
| Gross Margin vs Farm Size | 85 | 0.721 | 0.039 * |

Note: * significant at 0.05

## 3.7 Planting intentions and receptiveness to intervention.

**3.7.1 Planting intention for 2006 cropping**. Ninety two percent (92%) of the farmers followed the April to June wet cropping season. Among them, 39% planted on the same month.

Of the 125 parcels planted during the 2005 wet season cropping, 115 parcels were again cultivated/planned to be cultivated during the same period in 2006. The practice validates a fairly fixed cycle of seasonal cropping.

**Table 35. Planting Intention for the 2006 wet season**

| Response | Wet Season 2005 | | Wet Season 2006 | |
|---|---|---|---|---|
| | # | % | # | % |
| **Date of planting** | | | | |
| April | 11 | 9 | 0 | 0 |
| May | 83 | 66 | 97 | 78 |
| June | 31 | 25 | 18 | 14 |
| Total | 125 | 100 | 115 | 92 |
| **Farmers With the Same Cropping Dates** | **#** | **%** | | |
| Same April | 0 | 0 | | |
| Same May | 46 | 37 | | |
| Same June | 3 | 2 | | |
| Total | 49 | 39 | | |

**3.7.2 Other climate-related information needed by farmers**. Interviewed farmers suggested ways to better the present climate/weather forecasting service. Among the specific climate-related information further needed in the field were general information on climate/weather concerns, detailed rainfall forecast (12%), location specific advisories, agriculture-specific advisories(4%), occurrence of El Niño and La Niña(5%), and generally more accurate advisories/forecasts (15%). Only 27% stated that they have nothing else to ask for. Eighteen percent (18%) of the respondents gave no answer.

**Table 36. Other specific climate-related information needed by farmers**

| Response | Frequency | % |
|---|---|---|
| About rain, typhoons and floods/anything about the weather | 4 | 5 |
| Accurate information/on time and reliable forecast | 13 | 15 |
| Agriculture related information/ If rain is already enough to plant corn/ Climate for the next cropping season to determine what crop to plant | 3 | 4 |
| Correct amount, start date and frequency of rainfall | 10 | 12 |
| Earlier advisory on dry season | 1 | 1 |
| Explanations on terminologies/details on forecast for easy understanding | 3 | 4 |
| If the weather is normal /moderate | 2 | 2 |
| Information on particular/next season, municipality/barangay-specific forecast | 2 | 2 |
| Occurrence of drought | 2 | 2 |
| Occurrence of El Niño/La Niña | 4 | 5 |
| Update on forecasts | 2 | 2 |
| No additional information needed | 23 | 27 |
| Not sure what else is needed | 1 | 1 |
| No answer | 15 | 18 |
| Total | 85 | 100 |

## 3.8 Existing development programs on corn as enumerated by farmers

Seventy nine percent of the respondents confirmed the presence of government/ non-government programs in aid of corn growers. Only 20% stated that they had never received assistance from outside. Among the development programs cited, seed subsidy was the most common (71%). Twenty-one percent had attended trainings/seminars on corn, while 5% received technological support. Formal credit was scarce with only 5% of the respondents receiving such support.

**Table 37. Farmers' perception on existence of government/ non-government programs on corn**

| Response | Frequency | % |
|---|---|---|
| Yes | 67 | 79 |
| None | 17 | 20 |
| No answer | 1 | 1 |
| Total | 85 | 100 |

**Table 38. Existing programs on corn as enumerated by farmers**

| Response | Frequency | % |
|---|---|---|
| Seed Subsidy | 60 | 71 |
| Seminars and trainings | 18 | 21 |
| IPM technology/ technology support | 4 | 5 |
| Fertilizer subsidy | 1 | 1 |
| Relief after typhoon | 1 | 1 |
| Credit/ Quedancor | 4 | 5 |

## 4.0 Implications and Recommendations

**4.1 Knowledge on Climate Forecast and Related Information.** PAGASA has been coming-out with an array of climate-related forecasts and information products, but only a few of these are made accessible and applicable to agricultural workers.

Of the 10 climate information products being provided by PAGASA, only the El Niño/La Niña advisories (94%) and tropical cyclone warnings (85%) were familiar to the interviewed farmers. A very small number claimed knowledge of the other information products. Among those who knew and made use of the materials, less than 20% gave negative feedback on their usefulness and reliability—implying that majority still believed in the utility and accuracy of the advisories/forecasts. This provides an impetus and presents a good opportunity for the meteorological agency to better its services and create a more positive impression and lasting impact among its clienteles.

PAGASA must also exert more effort in disseminating its other information products. Information only gains value when it is put to proper use. This is true for the PAGASA service—optimum utility could only be had if its information products are made readily available and accessible to potential users.

Television and radio were the most common sources of information on climate related concerns. Many also relied on co-farmers, technicians and indigenous knowledge. A few read newspapers. These highlight the communication channels, which are most effective for reaching out to target farmer populations. Our meteorological service and other relevant entities should capitalize on these channels in making its information products more accessible.

**4.2 Farmers' Psychology.** The importance of climate and climate-related information among farmers cannot be questioned. Almost all of the respondents validated the significance of seasonal climate forecasts, with three fourths agreeing that climate variability is a major source of uncertainty in their agricultural operations. All those interviewed also affirmed the relevance of climate-related information on crop production. Addressing climatic concerns through appropriate advisories is therefore of paramount importance. With majority of farmers recognizing the matter as truly significant, selling new ideas or interventions to them would be a lot easier.

The need for more accurate information and better extension services was evident on the responses made by farmers. Just barely half of those interviewed answered that the information they received were sufficient and correct. The same number also expressed satisfaction on climate related information. With so many farmers airing discontent on the amount and accuracy of information they are receiving, the need for improvements seemed very apparent. A satisfaction rating of only 58% also hints on the necessity of climate information tapered to the requirements of local farmers.

The need for credible climate information is further highlighted by the farmers' perceptions on climatic variabilities. One-third aired uncertainty over the reliability of seasonal rainfall. In addition, about 70% of farmers perceived that dry spells recur as frequently as 1-2 years. The figures are alarming as they add to the psychological insecurity among farmers. If it is true that the occurrence of localized drought is indeed as frequent, then the risks in rainfed farming are greatly multiplied. A thorough study of agroclimatic factors, as they relate to agriculture, should be done to properly adjust crop production operations.

The attitude of farmers towards risk makes them ideal candidates for technological interventions. Most of the respondents only wished for an assured crop harvest. Many preferred a conservative option over a high-risk-high-profit alternative. This implies that farmers will be more than happy to receive accurate seasonal climate advisories. Assuring that there would be sufficient rainfall in a cropping season would provide the farmers a much-needed sense of security.

**4.3 Key production decisions.** Climate-related concerns and information were claimed to be among the major factors considered by farmers in their decision-making. Next to capital, climate was the number one concern of farmers when it comes to crop production. Both seasonal climate forecasts and climatic variabilities (like excessive rains and drought) were also said to greatly influence decisions on working capital, type of crop to plant, and time of planting. On corn production, SCF helped farmers decide on varieties to use and what levels of production inputs to apply.

When asked about why SCF is important, 96% of the respondents answered that it aids in on-farm decision-making. Specifically, farmers appreciated how SCF allows them to prepare for climatic events. Many also recognized the role of climatic information in deciding when to plant or commence the cropping season. These answers are very close to what researchers and development workers have been advocating. Reliable SCF really could help farmers decide on proper timing of farm operations and prepare for destructive climatic events. This seeming match between the ideals of farmers and change agents may possibly make the campaign on SCF use much easier.

However, a closer scrutiny should be made when interpreting the figures. Regard for SCF may be high, but is this view effectively translated into action? People should be more discerning about what is actually happening in the field.

Overall, the responses made by farmers reinforce the earlier claim on the significance of climate variability and SCF. These are two factors that cannot be overlooked in on-farm decision-making. Affected decisions like the kind of crop to plant, cropping schedule, and inputs to apply, critically determine the level of productivity a farmer can achieve. Climatic considerations and the success of local farming are therefore directly connected. Failure to make the fit will most likely result to an unproductive season.

**4.4 Indigenous knowledge.** A long list of traditional forecasting methods was gathered from interviewed farmers. The indigenous means, however, were focused more on seasonal onset and day-to-day weather. Projections on seasonal variability like possible occurrence of drought and excessive rains were few.

Indigenous mitigating measures, as well as, modern interventions against droughts and floodings were also found wanting. It seemed that many farmers were resigned to the idea that destruction from these climatic anomalies could not be helped. This sense of "hopelessness" is dangerous as it inculcates a culture of passiveness among farmers.

The situation opens-up avenues for development initiatives and interventions. Proper technological ways of addressing problems caused by climatic variabilities should be extended to local corn growers. The problem on drought could be mitigated with the use of on-farm reservoirs and other small-scale irrigation systems. The harmful effects of excessive rains and flooding could be minimized through proper cultural practices. The use of appropriate crops and proper timing of planting would also help farmers cope-up with climatic challenges. Much could still be done to aid farmers and further improve productivity in the country's corn producing areas.

With the absence of reliable indigenous climate forecasting means, the role of local weather stations is further highlighted. PAGASA should work on delivering more accurate and timely seasonal forecasts in order to address environmental uncertainties and the needs of the agriculture sector.

One third of the farmers still believed in superstitions when commencing farm activities. Good luck and bad luck beliefs influenced decisions on the timing of and cultural approaches to certain farm operations. Though not with scientific basis, these beliefs and practices are part and parcel of the indigenous make-up of local farmers. Researchers and development workers will have to address these when pushing for the adoption of applicable technological interventions.

**4.5 Farmers' practices and level of farm productivity**. The cropping practices of many interviewed farmers were very predictable. Yearly and seasonal cropping routines were pretty much fixed. Most farmers had two croppings of corn commencing at the start of the wet and dry seasons. The former starts from April to June, while the latter commences from October to December.

A bit of inconsistency was observed in the answer of farmers. Though many claimed to refer to SCF when it comes to on-farm decision-making, actual application seemed to be not enough. The start of each cropping season was still principally based on the coming of rains and the usual seasonal schedule. Sustained rainfall usually signaled the commencement of planting operations. Though 56% professed the influence of SCF on general timing of planting in farm operations, only 1% claimed the same effect on the planting schedule for corn. This shortcoming particularly makes farmers susceptible to damages due to climatic variability. This was proven in 2005 when many corn growers had to replant three times due to El Niño/La Niña induced drought and floodings.

Interestingly, corn yields registered higher during the dry season or October to December cropping. This may also be the reason why the farm area planted to corn was higher during this period. Isabela must still be receiving substantial precipitation even during so –called dry months, as the province borders on climate types III and IV (short dry season and even rainfall year-round). Higher solar radiation and lesser occurrences of pests during dry season must have also contributed to better corn productivity and yield.

Though far below ideal levels, the overall productivity of corn farms in Isabela was still higher than the national average, which was pegged at only 2.15MT in 2005 (BAS, 2006). With yields in Isabela averaging at 3.11MT, many could claim the advantage. However, this level of productivity was still found wanting by smallholder farmers.

An average net return of just ₱12,651.00 per hectare for smallholder farmers make this group highly vulnerable. With 28% owning less than 1 hectare and another 23% tilling just up to 2 hectares, the extent of socio-economic inequity among local corn farmers must be great. Well-off growers take advantage of the situation through economics of scale. Bigger land holdings allow them to earn more per season. But for smallholder farmers, the earning potential is limited by small farm sizes. A minor consolation for small land owners is their seemingly higher yield and gross margin per hectare. Average figures on production and monetary returns were a bit higher for farmers with less than 3 hectares. This may be explained by the higher cost of production per hectare for many farmers in this group. A possible explanation is that big landowners may have been scrimping on inputs and extending materials over a wider farm area.

In terms of topography, lowland farms proved more productive, surpassing their upland counterparts in terms of yield, gross sales, cost, and gross margin. This observation hints on the potential of the broad and flood plains of Isabela for greater outputs. It also highlights the opportunity to elevate corn productivity in rolling and hilly lands.

Poor level of earnings coupled with large household sizes, translate to widespread poverty among smallholder corn growers. Given low average per hectare returns, two seasons of cropping per year would only give a 5-member household an annual per capita income of around ₱5,000.00. This level of income would not be sufficient to properly feed, clothe, and educate each member of the farm family.

Many claimed that only a yield of about 6MT could earn for them enough money to pay for the season’s debts and still support a family. If this is true, then everyone concerned should work toward elevating corn productivity to exceptional levels. The target is not impossible, as local farmers have been known to produce as much as 10MT per hectare. The challenge is how to duplicate these small successes and allow more farmers to reap the benefits of modern advances in agriculture.

**4.6 Planting intentions and need for more climate information products.** The planting schedules of farmers for the past two wet cropping seasons revealed an unmistakable pattern. Many had been following a personal cropping calendar that fall within a general pattern of two croppings per year.

More than 90% of interviewed farmers were practicing a fairly routine planting schedule. The figure hinted on the conservativeness of farmers when it comes to their cropping operations. Even though many suffered crop losses during the same period last year, farmers still stuck to their traditional planting dates.

The planting intentions of farmers further highlighted the importance of seasonal climate advisories. Without reliable forecasts, many would just follow the cropping practices they have been accustomed to for so many years. The crop losses of 2005 could have been minimized if reliable seasonal advisories have been made available early on.

The additional climate-related information requested by farmers seemed rational. The call for more information on climate/weather concerns, detailed rainfall forecast, location specific advisories, agriculture-specific advisories, forecasts on El Niño and La Niña, and generally more accurate advisories reflected the major information gaps that needed to be bridged by concerned service institutions.

**4.7 Receptiveness to development interventions.** In terms of receptiveness to interventions, farmers showed keen interest in receiving outside help. Knowing that 94% of them had at one time experienced crop failure is quite alarming. Worse is the fact that 67% of the farmers thought that such losses were inevitable and would just have to be accepted. Though saddening, this is both an obstacle and an opportunity for development interventions. Change agents must be convincing enough to make farmers realize that they can do more to save their crops and mitigate losses due to climatic variability.

Indeed, things have to be improved, with many smallholder corn farmers confessing that they were not earning enough, and actually incurring more debts every cropping season. If simple advances in agricultural technology could address the socio-economic plight of corn farmers, then not a second should be wasted in delivering these productivity tools.

A positive indicator is that development programs from government and non-government organizations had reached 79% of the farmers. This implies that development machineries are moving and working toward making local farmers more productive. The assistance, however, seemed inadequate as many farmers still fall short of acceptable productivity levels. Though noble in intention, the support being provided under these programs seemed inadequate. Seed subsidy may not be the best solution as many aired doubts on the quality of seeds being dispersed. Seminars, trainings, and technology support should receive more attention as these help in developing the capacity of local farmers. Credit facility is also a good intervention to look at, as farmers have long been exploited by local usurers. The availment of crop insurance is also an attractive option for the corn farming communities of Isabela.

## 5.0 Conclusions

Climate and climate-related information were undoubtedly among the major factors being considered by farmers in their crop production activities. All aspects explored on the psychology of corn growers points to their significance in local farming operations. The high levels of importance given to climatic conditions and seasonal climate forecasts were evident on the farmers' perceptions, attitudes, and decision-making processes. With corn farmers in Isabela still thirsting for climate-related information, the delivery of appropriate information and accurate forecasts should be addressed through proper extension and provision of support.

Ranking second only to capital, climate information proved to be a major factor in on-farm decision-making. More than anything, this provides a clear picture of farmers' psychology on the use of climate information. With critical production decisions founded on climate-related concerns, the provision of proper information and advisories by relevant institutions has the potential of improving over-all farm productivity. Caution should however be exercised in interpreting this finding. The level of significance can only be validated by what could be seen on the field.

Though the high regard of farmers on climate forecast and information cannot be questioned, actual application of such information seemed still wanting. Most corn farmers still start the season by “feel”—relying on the coming of rains and usual seasonal cropping schedules when commencing key farm operations. Seasonal climate forecast still has to solidify its role in the decision making process. But before this could happen, the country’s meteorological service must first gain the trust of local growers through more timely and reliable climate information products.

Following a cropping routine is not bad. Two corn cropping in a year must be the most convenient practice for many Isabela growers. But farmers should be pro-active enough to adjust to seasonal climatic abnormalities. This could only happen if they are open to information and outside interventions. The conservativeness of farmers might work two ways—it could either make them resist changes, or allow them to accept the security of appropriate and properly timed information. Many had equated climatic variability with crop failure and poor harvests-- in the same light, appropriate seasonal climate forecasts could be equated to saved crops and better-prepared farmers.

Without doubt, climate/weather information are very much welcome among farmers. The cropping seasons are truly dependent on the coming of rains. However, a significant number of farmers are still questioning the reliability of forecasts being made by our local weather stations. Much has to be done to build-up local confidence on our weather bureau. A conservative group of target clientele would always prefer a secured venture. The psychology of farmers could only be appeased if uncertainties like climate variability could be properly addressed. Reliable seasonal climate forecasts remain the key to answer the riddle of seasonal variability and allow farmers to securely harness the goodness of the changing seasons.

Reliable indigenous knowledge on climate forecasting was scarce. Forecasting seasonal variability is therefore solely in the hands of our weather bureaus. Other support institutions should also do their part in helping farmers cope-up with the destructive effects of drought, excessive rains and floodings. Corn farmers should not only be recipients of information, but also target clienteles for the transfer of appropriate agricultural technologies.

Indeed, much could still be done to improve the productivity of corn farming in Isabela. The local average yield of a little more than 3MT is still quite low compared to the yield potential of present commercial varieties. Ultimately, a holistic approach is necessary to truly elevate the productivity in the country’s corn lands. Only an appropriate combination of technological interventions—from improved varieties, better cultural practices, irrigation support, seasonal climate forecasts and proper information and knowhow—could reverse the tide of poor productivity among local corn growers.

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## ANNEX 1: Appendix Tables

**Appendix Table 1. Cross Tabulation of Frequencies (Yield Range/Gross Sales/Cost/Gross Margin) vs. Location (Barangay and Municipal Levels)**

| Range | Angadanan | | | | | Echague | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Duroc | La Suerte | Pissay | Rang-ayan | Subtotal | Annafunan | Dugayong | Narra | Pagasa | Subtotal | |
| **YIELD(KG)** | | | | | | | | | | | |
| 0≤1000 | 1 | 3 | - | 4 | 8 | 1 | - | 1 | - | 2 | 10 |
| 1000≤2000 | 1 | 3 | 1 | 3 | 8 | - | - | 1 | 3 | 4 | 12 |
| 2000≤3000 | 1 | 3 | 2 | 2 | 8 | 2 | 1 | 3 | 3 | 9 | 17 |
| 3000≤4000 | 3 | - | 5 | - | 8 | - | 1 | 1 | - | 2 | 10 |
| 4000≤5000 | - | 1 | - | - | 1 | 3 | 3 | 2 | - | 8 | 9 |
| 5000≤6000 | | - | 2 | - | 2 | 2 | 1 | | 1 | 4 | 6 |
| >6000 | 2 | 1 | - | 1 | 4 | - | 4 | 1 | - | 5 | 9 |
| TOTAL | 8 | 11 | 10 | 10 | 39 | 8 | 10 | 9 | 7 | 34 | 73 |
| **GROSS SALES(PhP)** | | | | | | | | | | | |
| <10000 | 1 | 3 | - | 4 | 8 | 1 | - | 1 | - | 2 | 10 |
| 10000<20000 | 1 | 3 | 1 | 3 | 8 | - | - | 2 | 3 | 5 | 13 |
| 20000<30000 | 1 | 3 | 2 | 2 | 8 | 2 | 2 | 2 | 3 | 9 | 17 |
| 30000<40000 | 3 | 1 | 5 | - | 9 | - | - | 1 | - | 1 | 10 |
| 40000<50000 | - | - | 1 | - | 1 | 4 | 4 | 2 | - | 10 | 11 |
| 50000<60000 | - | - | 1 | - | 1 | 1 | 1 | - | 1 | 3 | 4 |
| 60000<70000 | - | - | - | - | - | - | 2 | - | - | 2 | 2 |
| 70000<80000 | 2 | 1 | - | - | 3 | - | - | 1 | - | 1 | 4 |
| >80000 | - | - | - | 1 | 1 | - | 1 | - | - | 1 | 2 |
| TOTAL | 8 | 11 | 10 | 10 | 39 | 8 | 10 | 9 | 7 | 34 | 73 |
| **COST (PhP)** | | | | | | | | | | | |
| 0<5000 | 1 | - | - | - | 1 | - | - | - | 1 | 1 | 2 |
| 5000<10000 | 2 | 1 | 5 | 2 | 10 | 1 | - | 2 | 2 | 5 | 15 |
| 10000<15000 | 3 | 5 | 4 | 4 | 16 | 4 | 5 | 6 | 2 | 17 | 33 |
| 15000<20000 | 2 | 5 | 1 | 4 | 12 | 3 | 1 | 2 | 4 | 10 | 22 |
| 20000<25000 | - | - | 1 | 2 | 3 | 2 | 2 | 1 | - | 5 | 8 |
| 25000<30000 | - | - | - | - | - | - | 1 | - | 1 | 2 | 2 |
| >30000 | 1 | 1 | - | - | 2 | - | 1 | - | - | 1 | 3 |
| TOTAL | 9 | 12 | 11 | 12 | 44 | 10 | 10 | 11 | 10 | 41 | 85 |
| **GROSS MARGIN (PhP)** | | | | | | | | | | | |
| <0 | 2 | 4 | 1 | 8 | 15 | 4 | - | 3 | 4 | 11 | 26 |
| 0<5000 | - | 2 | 1 | 1 | 4 | - | 1 | 1 | 1 | 3 | 7 |
| 5000<10000 | 1 | 2 | 1 | 1 | 5 | 1 | 1 | 2 | 4 | 8 | 13 |
| 10000<15000 | - | 1 | 1 | 1 | 3 | - | - | 1 | - | 1 | 4 |
| 15000<20000 | 2 | 1 | 2 | - | 5 | - | 1 | - | - | 1 | 6 |
| 20000<25000 | - | 1 | 1 | - | 2 | 1 | - | 1 | - | 2 | 4 |
| 25000<30000 | 1 | - | 1 | - | 2 | 2 | 1 | 1 | - | 4 | 6 |
| >30000 | 3 | 1 | 3 | 1 | 8 | 2 | 6 | 2 | 1 | 11 | 19 |
| TOTAL | 9 | 12 | 11 | 12 | 44 | 10 | 10 | 11 | 10 | 41 | 85 |

Note: Rang-ayan, La Suerte, Narra and Pagasa and predominantly upland areas, while Duroc, Pissay, Annafunan and Dugayong are broad and flood plains.

**Appendix Table 2. Cross Tabulation of Percentages (Yield Range/Gross Sales/Cost/Gross Margin) vs. Location (Barangay and Municipal Levels)**

| Range | Angadanan | | | | | Echague | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Duroc | La Suerte | Pissay | Rang-ayan | Subtotal | Annafunan | Dugayong | Narra | Pagasa | Subtotal | |
| **YIELD(Kg)** | | | | | | | | | | | |
| 0≤1000 | 1 | 4 | - | 5 | 9 | 1 | - | 1 | - | 2 | 12 |
| 1000≤2000 | 1 | 4 | 1 | 4 | 9 | - | - | 1 | 4 | 5 | 14 |
| 2000≤3000 | 1 | 4 | 2 | 2 | 9 | 2 | 1 | 4 | 4 | 11 | 20 |
| 3000≤4000 | 4 | - | 6 | - | 9 | - | 1 | 1 | - | 2 | 12 |
| 4000≤5000 | - | 1 | - | - | 1 | 4 | 4 | 2 | - | 9 | 11 |
| 5000≤6000 | - | - | 2 | - | 2 | 2 | 1 | - | 1 | 5 | 7 |
| >6000 | 2 | 1 | - | 1 | 5 | - | 5 | 1 | - | 6 | 11 |
| TOTAL | 9 | 13 | 12 | 12 | 46 | 9 | 12 | 11 | 8 | 40 | 86 |
| **GROSS SALES(PhP)** | | | | | | | | | | | |
| ≤10000 | 1 | 4 | - | 5 | 9 | 1 | - | 1 | - | 2 | 12 |
| 10000≤20000 | 1 | 4 | 1 | 4 | 9 | - | - | 2 | 4 | 6 | 15 |
| 20000≤30000 | 1 | 4 | 2 | 2 | 9 | 2 | 2 | 2 | 4 | 11 | 20 |
| 30000≤40000 | 4 | 1 | 6 | - | 11 | - | - | 1 | - | 1 | 12 |
| 40000≤50000 | - | - | 1 | - | 1 | 5 | 5 | 2 | - | 12 | 13 |
| 50000≤60000 | - | - | 1 | - | 1 | 1 | 1 | - | 1 | 4 | 5 |
| 60000≤70000 | - | - | - | - | - | - | 2 | - | - | 2 | 2 |
| 70000≤80000 | 2 | 1 | - | - | 4 | - | - | 1 | - | 1 | 5 |
| >80000 | - | - | - | 1 | 1 | - | 1 | - | - | 1 | 2 |
| TOTAL | 9 | 13 | 12 | 12 | 46 | 9 | 12 | 11 | 8 | 40 | 86 |
| **COST(PhP)** | | | | | | | | | | | |
| 0<5000 | 1 | - | - | - | 1 | - | - | - | 1 | 1 | 2 |
| 5000≤10000 | 2 | 1 | 6 | 2 | 12 | 1 | - | 2 | 2 | 6 | 18 |
| 10000≤15000 | 4 | 6 | 5 | 5 | 19 | 5 | 6 | 7 | 2 | 20 | 39 |
| 15000≤20000 | 2 | 6 | 1 | 5 | 14 | 4 | 1 | 2 | 5 | 12 | 26 |
| 20000≤25000 | - | - | 1 | 2 | 4 | 2 | 2 | 1 | - | 6 | 9 |
| 25000≤30000 | - | - | - | - | - | - | 1 | - | 1 | 2 | 2 |
| >30000 | 1 | 1 | - | - | 2 | - | 1 | - | - | 1 | 4 |
| TOTAL | 11 | 14 | 13 | 14 | 52 | 12 | 12 | 13 | 12 | 48 | 100 |
| **GROSS MARGIN(PhP)** | | | | | | | | | | | |
| <0 | 2 | 5 | 1 | 9 | 18 | 5 | - | 4 | 5 | 13 | 31 |
| 0≤5000 | - | 2 | 1 | 1 | 5 | - | 1 | 1 | 1 | 4 | 8 |
| 5000≤10000 | 1 | 2 | 1 | 1 | 6 | 1 | 1 | 2 | 5 | 9 | 15 |
| 10000≤15000 | - | 1 | 1 | 1 | 4 | - | - | 1 | - | 1 | 5 |
| 15000≤20000 | 2 | 1 | 2 | - | 6 | - | 1 | - | - | 1 | 7 |
| 20000≤25000 | - | 1 | 1 | - | 2 | 1 | - | 1 | - | 2 | 5 |
| 25000≤30000 | 1 | - | 1 | - | 2 | 2 | 1 | 1 | - | 5 | 7 |
| >30000 | 4 | 1 | 4 | 1 | 9 | 2 | 7 | 2 | 1 | 13 | 22 |
| TOTAL | 11 | 14 | 13 | 14 | 52 | 12 | 12 | 13 | 12 | 48 | 100 |

Note: Rang-ayan, La Suerte, Narra and Pagasa and predominantly upland areas, while Duroc, Pissay, Annafunan and Dugayong are broad and flood plains.

**Appendix Table 3. Comparative performance between flood plains, broad plains and hilly lands (Frequency)**

| ITEM | TOPOGRAPHY (Frequency) | | | | Total |
|---|---|---|---|---|---|
| | Flood Plain | Broad Plain | Plain Subtotal | Hilly/Rolling Land | |
| **YIELD(kg)** | | | | | |
| 0≤1,000 | 2 | 1 | 3 | 7 | 10 |
| 1,000≤2,000 | 1 | 1 | 2 | 10 | 12 |
| 2,000≤3,000 | 7 | 3 | 10 | 7 | 17 |
| 3,000≤4,000 | 6 | 4 | 10 | - | 10 |
| 4,000≤5,000 | - | 7 | 7 | 2 | 9 |
| 5,000≤6,000 | 5 | - | 5 | 1 | 6 |
| >6,000 | 2 | 5 | 7 | 2 | 9 |
| Total | 23 | 21 | 44 | 29 | 73 |
| **GROSS SALES(PhP)** | | | | | |
| ≤10,000 | 2 | 1 | 3 | 7 | 10 |
| 10,000≤20,000 | 2 | 1 | 3 | 10 | 13 |
| 20,000≤30,000 | 6 | 4 | 10 | 7 | 17 |
| 30,000≤40,000 | 6 | 4 | 10 | - | 10 |
| 40,000≤50,000 | 3 | 6 | 9 | 2 | 11 |
| 50,000≤60,000 | 2 | 1 | 3 | 1 | 4 |
| 60,000≤70,000 | 1 | 1 | 2 | - | 2 |
| 70,000≤80,000 | 1 | 2 | 3 | 1 | 4 |
| >80,000 | | 1 | 1 | 1 | 2 |
| Total | 23 | 21 | 44 | 29 | 73 |
| **COST(PhP)** | | | | | |
| ≤5,000 | 1 | - | 1 | 1 | 2 |
| 5,000≤10,000 | 7 | 2 | 9 | 6 | 15 |
| 10,000≤15,000 | 9 | 8 | 17 | 16 | 33 |
| 15,000≤20,000 | 6 | 5 | 11 | 11 | 22 |
| 20,000≤25,000 | 2 | 4 | 6 | 2 | 8 |
| 25,000≤30,000 | | 1 | 1 | 1 | 2 |
| >30,000 | 1 | 2 | 3 | - | 3 |
| Total | 26 | 22 | 48 | 37 | 85 |
| **GROSS MARGIN(PhP)** | | | | | |
| ≤0 | 6 | 2 | 8 | 18 | 26 |
| 0≤5,000 | 1 | 1 | 2 | 5 | 7 |
| 5,000≤10,000 | 3 | 4 | 7 | 6 | 13 |
| 10,000≤15,000 | 2 | - | 2 | 2 | 4 |
| 15,000≤20,000 | 1 | 4 | 5 | 1 | 6 |
| 20,000≤25,000 | 1 | 3 | 4 | - | 4 |
| 25,000≤30,000 | 4 | 1 | 5 | 1 | 6 |
| >30,000 | 8 | 7 | 15 | 4 | 19 |
| Total | 26 | 22 | 48 | 37 | 85 |

**Appendix Table 4. Comparative performance between flood plains, broad plains and hilly lands (Percentage)**

| | TOPOGRAPHY (percentage) | | | | |
|---|---|---|---|---|---|
| **ITEM** | **Flood Plain** | **Broad Plain** | **Plain Subtotal** | **Hilly/Rolling Land** | **Total** |
| **YIELD (kg)** | | | | | |
| 0≤1,000 | 2 | 1 | 4 | 8 | 12 |
| 1,000≤2,000 | 1 | 1 | 2 | 12 | 14 |
| 2,000≤3,000 | 8 | 4 | 12 | 8 | 20 |
| 3,000≤4,000 | 7 | 5 | 12 | - | 12 |
| 4,000≤5,000 | - | 8 | 8 | 2 | 11 |
| 5,000≤6,000 | 6 | - | 6 | 1 | 7 |
| >6,000 | 2 | 6 | 8 | 2 | 11 |
| Total | 27 | 25 | 52 | 34 | 86 |
| **GROSS SALES (PhP)** | | | | | |
| ≤10,000 | 2 | 1 | 4 | 8 | 12 |
| 10,000≤20,000 | 2 | 1 | 4 | 12 | 15 |
| 20,000≤30,000 | 7 | 5 | 12 | 8 | 20 |
| 30,000≤40,000 | 7 | 5 | 12 | - | 12 |
| 40,000≤50,000 | 4 | 7 | 11 | 2 | 13 |
| 50,000≤60,000 | 2 | 1 | 4 | 1 | 5 |
| 60,000≤70,000 | 1 | 1 | 2 | - | 2 |
| 70,000≤80,000 | 1 | 2 | 4 | 1 | 5 |
| >80,000 | - | 1 | 1 | 1 | 2 |
| Total | 27 | 25 | 52 | 34 | 86 |
| **COST(PhP)** | | | | | |
| ≤5,000 | 1 | - | 1 | 1 | 2 |
| 5,000≤10,000 | 8 | 2 | 11 | 7 | 18 |
| 10,000≤15,000 | 11 | 9 | 20 | 19 | 39 |
| 15,000≤20,000 | 7 | 6 | 13 | 13 | 26 |
| 20,000≤25,000 | 2 | 5 | 7 | 2 | 9 |
| 25,000≤30,000 | | 1 | 1 | 1 | 2 |
| >30,000 | 1 | 2 | 4 | - | 4 |
| Total | 31 | 26 | 56 | 44 | 100 |
| **GROSS MARGIN (PhP)** | | | | | |
| ≤0 | 7 | 2 | 9 | 21 | 31 |
| 0≤5,000 | 1 | 1 | 2 | 6 | 8 |
| 5,000≤10,000 | 4 | 5 | 8 | 7 | 15 |
| 10,000≤15,000 | 2 | - | 2 | 2 | 5 |
| 15,000≤20,000 | 1 | 5 | 6 | 1 | 7 |
| 20,000≤25,000 | 1 | 4 | 5 | - | 5 |
| 25,000≤30,000 | 5 | 1 | 6 | 1 | 7 |
| >30,000 | 9 | 8 | 18 | 5 | 22 |
| Total | 31 | 26 | 56 | 44 | 100 |

**Appendix Table 5. Cross Tabulation of Frequencies (Yield Range/Gross Sales/Cost/Gross Margin) vs. Farm Size**

| Range | FARM SIZE (Ha) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ≤0.5 | 0.5≤0.9 | 1 | 1.5 | 2 | 2≤2.5 | 2.5≤3 | 3≤4 | 4≤5 | 5≤10 | >10 | Total |
| **YIELD(Kg)** | | | | | | | | | | | | |
| 0≤1000 | 1 | - | 1 | - | 1 | 1 | 1 | - | 1 | 2 | 2 | 10 |
| 1000≤2000 | - | - | 4 | 3 | 2 | - | - | - | 1 | 2 | - | 12 |
| 2000≤3000 | - | 1 | 2 | 3 | 4 | - | 3 | 1 | 2 | 1 | - | 17 |
| 3000≤4000 | 3 | 1 | 2 | 1 | - | - | 1 | - | - | 1 | 1 | 10 |
| 4000≤5000 | 1 | 1 | 1 | - | - | - | 2 | 2 | 1 | 1 | - | 9 |
| 5000≤6000 | - | - | - | 2 | 1 | - | 1 | - | 1 | 1 | - | 6 |
| >6000 | 2 | 1 | 2 | - | 1 | 1 | 1 | - | - | 1 | - | 9 |
| TOTAL | 7 | 4 | 12 | 9 | 9 | 2 | 9 | 3 | 6 | 9 | 3 | 73 |
| **GROSS SALES(PhP)** | | | | | | | | | | | | |
| ≤10000 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 2 | 10 |
| 10000≤20000 | 0 | 0 | 4 | 3 | 3 | 0 | 0 | 0 | 1 | 2 | 0 | 13 |
| 20000≤30000 | 0 | 1 | 2 | 3 | 3 | 0 | 3 | 1 | 2 | 2 | 0 | 17 |
| 30000≤40000 | 4 | 1 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 10 |
| 40000≤50000 | 0 | 1 | 1 | 2 | 0 | 0 | 2 | 2 | 2 | 1 | 0 | 11 |
| 50000≤60000 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 4 |
| 60000≤70000 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 |
| 70000≤80000 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 4 |
| >80000 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| TOTAL | 7 | 4 | 12 | 9 | 9 | 2 | 9 | 3 | 6 | 9 | 3 | 73 |
| **COST(PhP)** | | | | | | | | | | | | |
| 0≤5000 | 1 | - | - | - | - | - | - | - | - | - | 1 | 2 |
| 5000≤10000 | 2 | - | 4 | 2 | 2 | 1 | 1 | - | 1 | 2 | - | 15 |
| 10000≤15000 | 3 | 1 | 5 | 4 | 2 | 2 | 6 | 2 | 3 | 5 | - | 33 |
| 15000≤20000 | 1 | - | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 3 | 22 |
| 20000≤25000 | - | 2 | 1 | 2 | 2 | - | - | 1 | - | - | - | 8 |
| 25000≤30000 | - | - | - | - | - | - | - | - | - | 2 | - | 2 |
| >30000 | - | 1 | - | - | 1 | 1 | - | - | - | - | - | 3 |
| TOTAL | 7 | 4 | 13 | 10 | 9 | 5 | 10 | 5 | 7 | 11 | 4 | 85 |
| **GROSS MARGIN(PhP)** | | | | | | | | | | | | |
| ≤0 | 1 | - | 2 | 2 | 3 | 4 | 2 | 2 | 2 | 5 | 3 | 26 |
| 0≤5000 | - | 1 | 3 | 1 | 1 | - | - | - | 1 | - | - | 7 |
| 5000≤10000 | - | 2 | 2 | 1 | - | - | 3 | 1 | 2 | 2 | - | 13 |
| 10000≤15000 | - | - | - | 1 | 3 | - | - | - | - | - | - | 4 |
| 15000≤20000 | - | - | 1 | 3 | - | - | - | - | - | 1 | 1 | 6 |
| 20000≤25000 | 2 | - | - | - | - | - | - | 1 | 1 | - | - | 4 |
| 25000≤30000 | - | - | 2 | 1 | - | - | 2 | 1 | - | - | - | 6 |
| >30000 | 4 | 1 | 3 | 1 | 2 | 1 | 3 | - | 1 | 3 | - | 19 |
| TOTAL | 7 | 4 | 13 | 10 | 9 | 5 | 10 | 5 | 7 | 11 | 4 | 85 |

**Appendix Table 6. Cross Tabulation of Percentages (Yield Range/Gross Sales/Cost/Gross Margin) vs. Farm Size**

| RANGE | FARM SIZE (Ha) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ≤0.5 | 0.5≤0.9 | 1 | 1.5 | 2 | 2≤2.5 | 2.5≤3 | 3≤4 | 4≤5 | 5≤10 | >10 | Total |
| **YIELD(Kg)** | | | | | | | | | | | | |
| 0≤1000 | 1 | - | 1 | - | 1 | 1 | 1 | - | 1 | 2 | 2 | 12 |
| 1000≤2000 | - | - | 5 | 4 | 2 | - | - | - | 1 | 2 | - | 14 |
| 2000≤3000 | - | 1 | 2 | 4 | 5 | - | 4 | 1 | 2 | 1 | - | 20 |
| 3000≤4000 | 4 | 1 | 2 | 1 | - | - | 1 | - | - | 1 | 1 | 12 |
| 4000≤5000 | 1 | 1 | 1 | - | - | - | 2 | 2 | 1 | 1 | - | 11 |
| 5000≤6000 | - | - | - | 2 | 1 | - | 1 | - | 1 | 1 | - | 7 |
| >6000 | 2 | 1 | 2 | - | 1 | 1 | 1 | - | - | 1 | - | 11 |
| TOTAL | 8 | 5 | 14 | 11 | 11 | 2 | 11 | 4 | 7 | 11 | 4 | 86 |
| **GROSS SALES(PhP)** | | | | | | | | | | | | |
| ≤10000 | 1 | - | 1 | - | 1 | 1 | 1 | - | 1 | 2 | 2 | 12 |
| 10000≤20000 | - | - | 5 | 4 | 4 | - | - | - | 1 | 2 | - | 15 |
| 20000≤30000 | - | 1 | 2 | 4 | 4 | - | 4 | 1 | 2 | 2 | - | 20 |
| 30000≤40000 | 5 | 1 | 2 | 1 | - | - | 1 | - | - | - | 1 | 12 |
| 40000≤50000 | - | 1 | 1 | 2 | - | - | 2 | 2 | 2 | 1 | - | 13 |
| 50000≤60000 | - | - | - | - | 1 | - | 1 | - | - | 2 | - | 5 |
| 60000≤70000 | - | - | 1 | - | - | 1 | - | - | - | - | - | 2 |
| 70000≤80000 | 2 | - | - | - | 1 | - | 1 | - | - | - | - | 5 |
| >80000 | - | 1 | 1 | - | - | - | - | - | - | - | - | 2 |
| TOTAL | 8 | 5 | 14 | 11 | 11 | 2 | 11 | 4 | 7 | 11 | 4 | 86 |
| **COST(PhP)** | | | | | | | | | | | | |
| 0≤5000 | 1 | - | - | - | - | - | - | - | - | - | 1 | 2 |
| 5000≤10000 | 2 | - | 5 | 2 | 2 | 1 | 1 | - | 1 | 2 | - | 18 |
| 10000≤15000 | 4 | 1 | 6 | 5 | 2 | 2 | 7 | 2 | 4 | 6 | - | 39 |
| 15000≤20000 | 1 | - | 4 | 2 | 2 | 1 | 4 | 2 | 4 | 2 | 4 | 26 |
| 20000≤25000 | - | 2 | 1 | 2 | 2 | - | - | 1 | - | - | - | 9 |
| 25000≤30000 | - | - | - | - | - | - | - | - | - | 2 | - | 2 |
| >30000 | - | 1 | - | - | 1 | 1 | - | - | - | - | - | 4 |
| TOTAL | 8 | 5 | 15 | 12 | 11 | 6 | 12 | 6 | 8 | 13 | 5 | 100 |
| **GROSS MARGIN(PhP)** | | | | | | | | | | | | |
| <0 | 1 | - | 2 | 2 | 4 | 5 | 2 | 2 | 2 | 6 | 4 | 31 |
| 0≤5000 | - | 1 | 4 | 1 | 1 | - | - | - | 1 | - | - | 8 |
| 5000≤10000 | - | 2 | 2 | 1 | - | - | 4 | 1 | 2 | 2 | - | 15 |
| 10000≤15000 | - | - | - | 1 | 4 | - | - | - | - | - | - | 5 |
| 15000≤20000 | - | - | 1 | 4 | - | - | - | - | - | 1 | 1 | 7 |
| 20000≤25000 | 2 | - | - | - | - | - | - | 1 | 1 | - | - | 5 |
| 25000≤30000 | - | - | 2 | 1 | - | - | 2 | 1 | - | - | - | 7 |
| >30000 | 5 | 1 | 4 | 1 | 2 | 1 | 4 | - | 1 | 4 | - | 22 |
| TOTAL | 8 | 5 | 15 | 12 | 11 | 6 | 12 | 6 | 8 | 13 | 5 | 100 |

**ANNEX 2: Survey Questionnaires**

# Bridging the Gap Between Seasonal Climate Forecasts and Decision Makers in Agriculture

## FARM AND HOUSEHOLD SURVEY QUESTIONNAIRE

*Good morning/afternoon/evening! I am _____________ from the ________________________________, and I am part of a research team conducting a research project on "Bridging the Gap Between Seasonal Climate Forecasts (SCFs) and Decision Makers in Agriculture", which is funded by the Australian Centre for International Agricultural Research (ACIAR), and jointly implemented in the Philippines by the Philippine Institute for Development Studies (PIDS), Philippine Atmospheric and Geophysical and Astronomical Services Administration (PAGASA), and Leyte State University (LSU). This project will look into and close the gap between the potential and actual value and use of SCFs to agricultural systems and policies in the Philippines and Australia***.** *Specifically, we would like to know about your perception and actual use of seasonal climate information in your crop production management decisions. We would also like to document the farm and household characteristics, key decisions that are influenced by climate, information on corn production for the previous cropping season and planting intention for the following season, indigenous knowledge of climate forecasting, and coping mechanisms on the impact of El Niño/La Niña on production . We would like to assure you that the information that you will reveal in this interview will be used solely for purposes of research, and that your identity as well as your answers will be treated with confidentiality. In answering the questions, please remember that there are no correct or wrong answers. We are just after your honest opinion.*

***Basic Information:***

Name of Respondent: ___________________________________ Respondent No.:_______

Village/Sitio: ________________________ Barangay: _______________________________

Municipality/City: ___________________ Province: ________________________________

Date of Interview: ___________________ Interviewer: _____________________________

Time Interview Started: ______________ Time Interview Ended: _____________________

**A. Household Profile**

A1. Name of household head: __________________________________________________________

(Surname) (First Name) (Middle Name)

A2. Age: _________ A3. Sex: [ ] Male [ ] Female

A4. Highest educational attainment: _______________

A5. Civil status: [ ] Married [ ] Single [ ] Widow(er) [ ] Separated [ ] Other (specify) _______

A6. No. of household members:_________

| Name of Household members | Relationship | Age as of last birthday (years) | Educational Attainment (years) | Occupation | Monthly Income |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

A7. How many years have you resided in this barangay? __________ years

A8. A8.1. Primary occupation (in terms of time spent)

| | |
|---|---|
| [ ] Farmer | [ ] Driver |
| [ ] Livestock raiser | [ ] Housewife |
| [ ] Carpenter | [ ] Domestic helper |
| [ ] Office worker | [ ] Fisherman |
| [ ] Vendor/trader | [ ] Local government official |
| [ ] Teacher | [ ] Others (specify) ________________________________ |

A8.2. Secondary occupation (in terms of time spent)

| | |
|---|---|
| [ ] Farmer | [ ] Driver |
| [ ] Livestock raiser | [ ] Housewife |
| [ ] Carpenter | [ ] Domestic helper |
| [ ] Office worker | [ ] Fisherman |
| [ ] Vendor/trader | [ ] Local government official |
| [ ] Teacher | [ ] Others (specify) ________________________________ |

**B. Farm Characteristics, Farming Experience, and Land Use**

B1. How long have you been farming? _____________ years
How long have you been planting corn? ______________ years

B2. What is the total size of the land that you farm? _____________ ha

B3. Do you own any of the land that you farm? [ ] Yes → **Go to B4** [ ] No → **Go to B5**

B4. If yes,
B4.1. How much of the land that you farm do you own? ________ ha
B4.2. Do you rent out any part of this land to others? [ ] Yes [ ] No
B4.3. How much land that you farm is tenanted? ______________ ha

B5. If no,
B5.1. How much land that you farm is being leased? _______________ ha
B5.2. How much of the land that you farm is being tenanted? _______________ ha

B6. Including the land that you farm, please give details of all the parcels of land that you have *(Use additional sheet if necessary)*
Are there more than 4 parcels of land? [ ] Yes [ ] No

| Parcel Description | Parcel 1 | Parcel 2 | Parcel 3 | Parcel 4 |
|---|---|---|---|---|
| 1. Location: | | | | |
| Village/Sitio | | | | |
| Barangay | | | | |
| City/Municipality | | | | |
| 2. Physical Area (ha) | | | | |
| 3. % Alienable & Disposable Land | | | | |
| 4.1 Tenure status:<br>*1 = fully-owned*<br>*2 = tenanted*<br>*3 = rented/leased*<br>*4 = held under Certificate of Land Transfer (CLT)/Certificate of Land Ownership Award (CLOA)*<br>*5 = owner-like possession other than CLT/CLOA*<br>*6 = others (specify)* | | | | |
| 4.2 If rented/leased, please specify rental arrangement<br>*1 = If share-tenancy, specify sharing arrangement*<br>*2 = If fixed-rent tenancy, specify amount*<br>*3 = Without actual rent*<br>*4 = Others (specify)* | | | | |

| | | | | |
|---|---|---|---|---|
| 5. Land Type<br>*1 = River/flood plain (lower/upper vega)*<br>*2 = Broad plain*<br>*3 = Hilly/rolling* | | | | |
| 6. Dominant slope<br>*1 = 0-5% (level to gently sloping)*<br>*2 = 6-15% (sloping to rolling)*<br>*3 = 16-25% (slightly rolling to moderately steep)*<br>*4 = 26-45% (steep to hilly)*<br>*5 ≥ 45% (very steep)* | | | | |
| 7. Have observed soil erosion? (Y/N) | ☐ Yes ☐ No | ☐ Yes ☐ No | ☐ Yes ☐ No | ☐ Yes ☐ No |
| 7.1 If yes, specify the degree of soil erosion<br>*1 = Mild*<br>*2 = Moderate*<br>*3 = Severe* | | | | |
| 7.2 If yes, have you applied erosion control measures? (Y/N)<br>If yes, describe type<br>If no, why? | ☐ Yes ☐ No<br>__________<br>__________<br>__________ | ☐ Yes ☐ No<br>__________<br>__________<br>__________ | ☐ Yes ☐ No<br>__________<br>__________<br>__________ | ☐ Yes ☐ No<br>__________<br>__________<br>__________ |
| 7.3 If yes, specify source of soil conservation measures<br>*1 = NA; 2 = Self; 3 = ISF (Integrated Social Forestry); 4 = IRRI (International Rice Research Institute); 5 = ICRAF (International Centre for Research in Agroforestry); 6 = Farmer leader;*<br>*7 = Other farmers; 8 = Others (specify)* | | | | |

B7. In the preceding 6 months (i.e., previous cropping season), please estimate land use share (%) for each parcel.

| Land Use | Parcel 1 | Parcel 2 | Parcel 3 | Parcel 4 |
|---|---|---|---|---|
| Corn | | | | |
| Lowland rice | | | | |
| Upland rice | | | | |
| Cassava | | | | |
| Sweet potato | | | | |
| Vegetable (specify) | | | | |
| Fruit trees (specify) | | | | |
| Fallow (natural or improved) | | | | |
| Pasture/grazing | | | | |
| Others (specify) | | | | |

**C. Perception, Awareness and Use of Seasonal Climate Information**

C1. Do you think that weather/climate is a factor that you take into consideration in your planning and crop production decision making?
[ ] Yes [ ] No

If yes, how significant is its value or contribution to your farming enterprise?
[ ] low [ ] medium [ ] high

If no, why not? ______________________________________________________

C2. Do you think advanced information on seasonal climate will aid your production decisions?
[ ] Yes [ ] No

If yes, how? ___________________________________________________________________

If no, why not? ________________________________________________________________

C3. What is your source of information about the weather/climate? *(Ask respondent to enumerate as many as possible)*

[ ] Radio
[ ] Television
[ ] Newspapers (broadsheets)
[ ] Newspapers (Tabloid)
[ ] Extension worker
[ ] PAGASA station
[ ] Local beliefs or indigenous knowledge
[ ] Co-farmer
[ ] Others (specify) ________________________

C4. Are you satisfied with climate-related information provided by your source? [ ] Yes [ ] No

C4.1. Do they give adequate information? [ ] Yes [ ] No

C4.1.1. What specific climate-related information do you need that your source cannot deliver, if any?
___________________________________________________________________________

C4.2. Do they give correct information? [ ] Yes [ ] No

If yes, how? ______________________________________________________________

If no, why not? ___________________________________________________________

C5. How relevant are the climate-related information that you get from your source in relation to making decisions related to farming?

[ ] Very relevant
[ ] Moderately relevant
[ ] Relevant
[ ] Slightly relevant
[ ] Irrelevant

C6. Did you hear about the seasonal climate forecast by PAGASA? [ ] Yes [ ] No

If yes, do you feel confident on such forecast? [ ] Yes [ ] No

If no, why? ____________________________________________

C7. Are you aware of any of the climate information products and services of the PAGASA?

| Product/Service | Yes/No | Usefulness Rating | Reliability Rating |
|---|---|---|---|
| Monthly Weather Situation and Outlook | | | |
| Annual Seasonal Climate Forecasts | | | |
| El Nino/La Nina Advisory | | | |
| Tropical Cyclone Warning | | | |
| 10-Day Regional Agri-weather and Advisories | | | |
| Farm Weather Forecasts and Advisories | | | |
| Phil Agroclimatic Review and Outlook | | | |
| Press Release on Significant Weather/Climate Events | | | |
| Phil Agri-weather Forecasts | | | |
| Climate Impact Assessment Bulletin for Agriculture | | | |

Usefulness rating: 1 = not useful; 2 = somewhat useful; 3 = useful; 4 = highly useful; 5 = vital
Reliability rating: 1 = unreliable; 2 = somewhat reliable; 3 = reliable; 4 = excellent

C8. The following statements describe climate, seasonal climate forecast and its usefulness and characteristics. If you agree, disagree or uncertain on each statement, please answer "Yes", "No", or "I don't know", respectively.

| Statement | Yes | No | I don't know |
|---|---|---|---|
| 1. Climate is the average weather condition in a particular area that prevails over a particular period (e.g. season) | | | |
| 2. Climate is a major source of uncertainty in agricultural production | | | |
| 3. Seasonal climate forecasts (SCFs), which refer to forecasts made prior to the start of a season, would guide farmers' crop production decision making | | | |
| 4. SCF is an important information for crop production management decision. | | | |
| 5. Accurate SCF has the potential to reduce the uncertainty brought about by climate variability and risk | | | |
| 6. SCF should not be taken into account when making decisions in crop production. | | | |
| 7. SCF is useful because it allow us to know the amount and onset of rain in the next season. | | | |
| 8. SCF may help in predicting the likelihood of an impending disaster like mudslide, flood or drought | | | |

C9. Farmer's perceptions on various aspects of climate-related information

C9.1. Rainfall reliability
[ ] unreliable (1)
[ ] somewhat unreliable (2)
[ ] reliable (3)
[ ] somewhat reliable (4)
[ ] very reliable (5)

C9.2. Frequency of droughts
[ ] drought occurs every 2 years (1)
[ ] drought occurs every 5 years (2)
[ ] drought occurs every 10 years (3)
[ ] drought occurs every 15 years (4)
[ ] drought occurs every 20 years (5)

C9.3. Impact of seasonal rainfall on crop production
[ ] minimal (1)
[ ] low impact (2)
[ ] medium (3)
[ ] major or high (4)

*Note: Figures in parentheses represent the choices' codes.*

**D. Farmers' Attitudes Toward Risk**

D1. Based on your knowledge and using 12 pieces of stones, please indicate your prediction about the likelihood of rainfall event in the coming season by piling them into three groups, where each group represents a particular climate state [above normal (A), normal (N) or below normal (B)]. The number of stones in each group represents your prediction about the likelihood of rainfall event in the coming season this year.

| Climate State | Prediction (No. of Stones) | Probability |
|---|---|---|
| Above normal (A) | | |
| Normal (N) | | |
| Below normal (B) | | |

D2. Please indicate which yield forecast type do you prefer for each season?
[ ] A low yield forecast for the coming season but with 100% certainty.
[ ] A high yield forecast for the coming season but only a 50/50 chance of obtaining it.

D3. The following statements describe farmers' attitudes toward risk. If you agree, disagree or uncertain on each statement, please answer "Yes", "No", or "I don't know", respectively.

| Statement | Yes | No | I don't know |
|---|---|---|---|
| 1. I will risk the possibility of crop failure due to seasonal variability for a chance to earn more. | | | |
| 2. I will not gamble with my crop given an unfavorable seasonal forecast. | | | |
| 3. I prefer to have a conservative harvest but with a reliable seasonal forecast. | | | |

## E. Key Production Decisions Influenced by Climate

E1. What influences your crop production decisions?
[ ] capital
[ ] cost of inputs (seeds, fertilizers, pesticides, etc.)
[ ] selling price of produce
[ ] climate information
[ ] others (specify) ________________________________

E2. What kind of key decisions in your farm production activities are usually affected by climate variability and disturbances?
[ ] crop to plant
[ ] timing of planting
[ ] amount of money used for acquisition of certain inputs, etc.
[ ] others (specify) ________________________________

E3. What kind of key decisions in your farm production activities are usually affected by seasonal climate forecast information?
[ ] crop to plant
[ ] timing of planting
[ ] amount of money used for acquisition of certain inputs, etc.
[ ] others (specify) ________________________________

E4. What key decisions in your corn production are influenced by seasonal climate forecast information?
[ ] corn variety to plant
[ ] levels of production input applied
[ ] others (specify) ________________________________

E5. In the context of your corn production decisions, please rate the importance of the following seasonal climate forecast information.

| Climate Forecast Information | Rank |
|---|---|
| Start date for the rainy season | |
| Amount of rainfall in the area | |
| End date or duration of the rainy season | |
| Estimated number of days of rainfall for the season | |
| Others (specify) | |

**F. Farmers' Indigenous Knowledge of Climate Forecasting**

F1. Do you have any signs if the season is expected to be abnormally dry or wet? [ ] Yes [ ] No

If yes, please identify ____________________________________________________
______________________________________________________________________

F2. Do you watch out for any special signs when commencing the following farm operations?

| Operation | Indicators/Signs |
|---|---|
| 1. Land Preparation | |
| 2. Planting | |
| 3. Harvesting | |
| 4. Special activities (i.e., flood or drought mitigation) *Please specify* ________________________ ________________________ ________________________ ________________________ ________________________ ________________________ | |

F3. Do you have certain beliefs that determine whether it is good luck or bad luck to start land preparation/planting/harvesting/etc. at a particular time of the season? [ ] Yes [ ] No

If yes, please identify ____________________________________________________
______________________________________________________________________

F4. How reliable is your traditional method of forecasting seasonal climate condition?
[ ] unreliable [ ] reliable [ ] very reliable

**G. Mitigation Measures and Risk Coping Mechanisms of Farmers**

G1. Do you have any measures taken or implemented to minimize losses due to weather disturbances such as drought, flood, and typhoon?

| Weather Disturbance | Mitigating Measures | |
|---|---|---|
| | Indigenous | Modern Technology |
| Drought | | |
| Flood | | |
| Typhoon | | |

G2. Have you ever experienced crop failure? [ ] Yes [ ] No

If yes, what strategy do you usually practice to cope with the said failure?

____________________________________________________________

G3. Are there any existing government/non-government programs related to corn? (i.e., technology support, credit, etc.)

G4. Do you avail of crop insurance?

## H. Input Data for Farm/Field Decision Models

H1. Actual planting (previous cropping seasons)

H1.1. Please give details of your corn production for the previous cropping seasons.

| Item | Parcel 1 | Parcel 2 | Parcel 3 | Parcel 4 |
|---|---|---|---|---|
| *For the last wet (May-July 2005) cropping season:* | | | | |
| 1. Start of planting | | | | |
| 2. Area planted (ha) to corn | | | | |
| 3. Corn variety used | | | | |
| 4. Date of harvesting | | | | |
| 5. Qty. grain harvested (kg) | | | | |
| | | | | |
| *For the previous/dry (Sept.-Dec. 2005) cropping season:* | | | | |
| 1. Start of planting | | | | |
| 2. Area planted (ha) to corn | | | | |
| 3. Corn variety used | | | | |
| 4. Method of land cultivation **a**/ | | | | |
| 5. Planting method **b**/ | | | | |
| 6. Planting distribution **c**/ | | | | |
| 7. Row spacing (cm) | | | | |
| 8. Row direction, degrees from North (optional) | | | | |
| 9. Planting depth (cm) | | | | |
| 10. Soil Type (optional) | | | | |
| 11. Weed control **d**/ | | | | |
| 12.1. Pest/disease problem **e**/<br>12.2. Control measure applied **f**/ | | | | |
| 13.1. Use inorganic fertilizer? (Y/N)<br>13.2. If yes, specify kind of fertilizer and method of application | | | | |
| 14.1. Apply animal manure? (Y/N).<br>14.2. If yes, specify source | | | | |
| 15. Apply green manure? (Y/N) | | | | |
| 16. Return crop residues? (Y/N) | | | | |
| 17. Hired labor/carabao or cattle? (Y/N) | | | | |
| 18. Date of harvesting | | | | |
| 19. Qty. grain harvested (kg) | | | | |
| 19.1. Qty. sold (kg) | | | | |
| 19.2. Qty. reserved for seed next cropping | | | | |
| 19.3. Qty. stored for home consumption | | | | |
| 19.4. Qty. given, if there is any | | | | |
| 20. Place of sale **g/** | | | | |
| 21. Price received for the corn sold (PhP/kg) | | | | |
| 22. Cost of transport for qty. sold (PhP) | | | | |
| 23. Total receipts/revenues received | | | | |

a/ 1 = Zero tillage; 2 = Burning; 3 = Clearing; 4 = Up and down plowing; 5 = Straight plowing; 6 = Contour plowing; 7 = Other (specify)
b/ 1 = Dry seed; 2 = Nursery; 3 = Pre-germinated seed; 4 = Ratoon; 5 = Transplants; 6 = Other (specify)
c/ 1 = Hills; 2 = Rows; 3 = Uniform/broadcast; 4 = Other (specify)
d/ 1 = None; 2 = Handweeding; 3 = Hoe; 4 = Plowing; 5 = Other (specify)
e/ 1 = None; 2 = Slight; 3 = Moderate; 4 = Severe
f/ 1 = None; 2 = Chemical spray; 3 = Botanical control; 4 = Physical control; 5 = Combination; 6 = Other (specify)
g/ 1= Barangay; 2 = Town; c = Nearby City (specify)

H1.2. Using your largest corn parcel, please estimate the labor utilized in your corn production for the previous/dry (Sept.-Dec. 2005) cropping season.

.

(Parcel No.: __________ Area: _________ ha)

| Operation | Man-Day (MD) | | | Man-Animal-Day (MAD) | | | Animal-Day (AD) |
|---|---|---|---|---|---|---|---|
| | FL | HL | BL | FL | HL | BL | |
| Land preparation | | | | | | | |
| • Plowing (Ploughing) | | | | | | | |
| • Clearing | | | | | | | |
| • Furrowing | | | | | | | |
| Corn sowing | | | | | | | |
| Fertilizer application at planting | | | | | | | |
| Replanting | | | | | | | |
| Fertilizer application | | | | | | | |
| Interrow weeding | | | | | | | |
| Hand weeding | | | | | | | |
| Pest control | | | | | | | |
| Other crop care (specify) | | | | | | | |
| Harvesting of corn | | | | | | | |
| Post-harvest processing | | | | | | | |

FL = Family labor; HL = Hired labor; BL = Bayanihan labor

H1.3. Please give details of the wages for each operation for the previous/dry (Sept.-Dec. 2005) cropping season.

| Item | Wage/Unit |
|---|---|
| How much did you pay for farm labor? (PhP/MD) | |
| Please estimate the value of food, cigarettes and other incidentals that are provided to hired labor (PhP/MD) | |
| What wage would you expect to earn working on other farms? (PhP/MD) | |
| How much did you pay for a cow or carabao with operator for one day? (PhP/MAD) | |
| How much did you pay for a cow or carabao only for one day? (PhP/AD) | |

H1.4. Using the largest corn parcel, please estimate the cost of inputs for corn production for the previous/dry (Sept.-Dec. 2005) cropping season..

(Parcel No.: ___________ Area: __________ ha)

| Input | Price /Unit | Qty. Used | Total Qty. Purchased | Month Purchased | Place of Purchased | Total Transport Cost of Purchasing Inputs (back and forth) | Total Cost (PhP) | Cash or Credit | Source of Input |
|---|---|---|---|---|---|---|---|---|---|
| Seed (kg) | | | | | | | | | |
| Urea (46-0-0), kg | | | | | | | | | |
| Complete (14-14-14), kg | | | | | | | | | |
| Ammonium Sulphate(21-0-0), kg | | | | | | | | | |
| Ammonium Phosphate(16-20-0), kg | | | | | | | | | |
| Solophos (0-18-0), kg | | | | | | | | | |
| Muriate of Potash (0-0-50), kg | | | | | | | | | |
| Animal manure (kg) | | | | | | | | | |
| Other fertilizer, kg (specify) | | | | | | | | | |
| Pesticide, liter (specify) | | | | | | | | | |
| Herbicide, liter (specify) | | | | | | | | | |
| Other inputs (specify) | | | | | | | | | |

H2. Planting intention (present/next wet cropping season)

H2.1. Do you intend to plant corn on your farm anytime next cropping season? [ ] Yes [ ] No (Skip this subsection)

H2.2. Corn variety(ies) to be planted and expected date of planting and harvesting: *(Use additional sheet if necessary)*

| Item | Parcel 1 | Parcel 2 | Parcel 3 | Parcel 4 |
|---|---|---|---|---|
| 1. Corn variety(ies) to be planted | | | | |
| 2. Expected date of sowing/planting corn | | | | |
| 3. Area to be planted | | | | |
| 4. Expected date of harvesting | | | | |

THANK YOU FOR COOPERATION!!!

# Bridging the Gap Between Seasonal Climate Forecasts and Decision Makers in Agriculture

## FARM AND HOUSEHOLD SURVEY QUESTIONNAIRE

*Magandang umaga/tanghali/gabi! Ako ay si ________________ mula sa Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas (Philippine Institute for Development Studies o PIDS) at ako ay bahagi ng pangkat ng mga mananaliksik na kasalukuyang nagsasagawa ng isang pag-aaral tungkol sa kahalagahan ng paggamit ng pana-panahong abiso sa klima (seasonal climate forecast o SCF) sa pagsasaka. Ang proyektong ito ay may titulong "Bridging the gap between seasonal climate forecast and decision makers in agriculture" na isinasakatuparan ng tatlong institusyon sa Pilipinas – ang PIDS, Philippine Atmospheric and Geophysical and Astronomical Services Administration (PAGASA) at Leyte State University (LSU). Ang proyektong ito ay naglalayong sumuri at mag-ugnay sa aktuwal at maaaring halaga ng paggamit ng SCF sa mga pang-agrikulturang sistema at patakaran sa Pilipinas at Australya. Ang mga tiyak na layunin ng proyektong ito ay ang pag-alam sa mga pananaw at aktuwal na paggamit ng SCF ng mga nagtatanim ng mais sa kanilang mga desisyon sa pagsasaka at pagtala ng mga sumusunod na impormasyon: detalye ng kanilang pagsasaka at sambahayan, pangunahing desisyon sa pagsasaka na naaapektuhan ng klima o panahon, mga impormasyon tungkol sa pagsasaka ng mais noong mga nakalipas na taniman at mga balak sa darating o kasalukuyang taniman, mga sinauna at katutubong kaalaman ukol sa abiso sa klima, at mga pamamaraan upang maibsan ang epekto ng El Niño/La Niña. Nais naming tiyakin sa inyo na ang mga impormasyong aming makakalap sa panayam na ito ay gagamitin lamang sa proyektong ito at ang inyong mga kasagutan ay mananatiling lihim/pribado. Sa pagsagot sa mga katanungan, tandaan lamang na walang tama o maling kasagutan Ang nais lamang namin ay ang inyong tapat na opinion sa mga ito.*

Pangalan: ____________________________________ Bilang:_______
Sitio: _________________________ Barangay: _________________________________
Munisipyo: ___________________ Probinsya: _________________________________
Petsa ng Panayam: ________________ Tagapanayam: ______________________________
Simula ng panayam: _______________ Katapusan ng panayam: _____________________

**B. Detalye ng Sambahayan**

A1. Puno ng sambahayan: ______________________________________________________________________
(Apelyido) (Pangalan) (M. I.)

A2. Edad: _________ A3. Kasarian: [ ] Lalaki [ ] Babae
A4. Pinakamataas na pinag-aralan: _______________
A5. Katayuang sibil: [ ] May asawa [ ] Walang asawa [ ] Balo [ ] Hiwalay
A6. Bilang ng kasama sa bahay:_________

| Pangalan ng kasama sa bahay | Relasyon | Edad | Pinakamataas na pinag-aralan | Trabaho | Buwanang kita |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

A7. Ilang taon na kayong naninirahan sa barangay? _________ taon
A8. A8.1. Pangunahing hanapbuhay

[ ] Magsasaka
[ ] Tagapag-aalaga ng hayop
[ ] Karpintero
[ ] Mangingisda
[ ] Opisyal ng gobyerno
[ ] Drayber/namamasada
[ ] Katulong
[ ] Empleyado
[ ] Tindero
[ ] Guro
[ ] Iba pa ________________________________

A8.2. Iba pang hanapbuhay

[ ] Magsasaka
[ ] Tagapag-aalaga ng hayop
[ ] Karpintero
[ ] Mangingisda
[ ] Opisyal ng gobyerno
[ ] Drayber/namamasada
[ ] Katulong
[ ] Empleyado
[ ] Tindero
[ ] Guro
[ ] Iba pa ________________________________

**B. Detalye/Karanasan sa Pagsasaka at Gamit ng Lupa**

B1. Ilang taon na kayong nagsasaka? ____________ taon
Ilang taon na kayong nagtatanim ng mais? _____________ taon
B2. Gaano kalaki ang inyong lupang sinasaka? ____________ ektarya
B3. Pag-aari ninyo ba ang lupa? [ ] Oo [ ] Hindi
B4. Kung oo,
B4.1. Ilang ektarya ang sarili ninyong pag-aari? ________ ektarya
B4.2. Nagpapaupa ba kayo ng lupa sa iba? [ ] Oo [ ] Hindi
B4.3. Ilang ektarya ang inuupahan ng iba? _____________ ektarya
B5. Kung hindi,
B5.1. Ilang ektarya ang inuupahan? ______________ ektarya
B5.2. Ilang ektarya and kasaka kayo? ______________ ektarya
B6. Magbigay ng detalye tungkol sa lupang inyong sinasaka
Ilang lote/lupa/parsela ang inyong sinasaka?

| Deskripsyon ng Lote/Lupa/Parsela | Parsela 1 | Parsela 2 | Parsela 3 | Parsela 4 |
|---|---|---|---|---|
| 1. Lugar: | | | | |
| Sitio | | | | |
| Barangay | | | | |
| Munisipyo | | | | |
| 2. Laki ng Sakahan (ektarya) | | | | |
| 3. % ng lupa na hindi ginagamit | | | | |
| 4.1 Estado ng tenure ng lupa:<br>*1 = Pag-aari*<br>*2 = Kasaka*<br>*3 = Inuupahan*<br>*4 = Iba pa* | | | | |
| 4.2 Kung inuupahan,<br>*1 = Kung kasaka, paano ang hatian sa kita?*<br>*2 = Kung inuupahan, magkano ang upa?*<br>*3 = Walang upa*<br>*4 = Iba pa* | | | | |
| 5. Katangian ng lupa<br>*1 = River/flood plain (lower/upper vega)*<br>*2 = Broad plain*<br>*3 = Hilly/rolling* | | | | |
| 6. Dominanteng katangian ng lupa<br>*1 = 0-5% (level to gently sloping); patag*<br>*2 = 6-15% (sloping to rolling); medyo dahilig*<br>*3 = 16-25% (slightly rolling to moderately steep); dahilig*<br>*4 = 26-45% (steep to hilly); medyo matarik*<br>*5 ≥ 45% (very steep); matarik* | | | | |

| | | | | |
|---|---|---|---|---|
| 7. Nakaranas na ba kayo ng pagka-agnas ng lupa o erosyon?<br>Kung oo, sagutin ang mga sumusunod: | ☐ Oo<br>☐ Hindi | ☐ Oo<br>☐ Hindi | ☐ Oo<br>☐ Hindi | ☐ Oo<br>☐ Hindi |
| 7.1 Gaano katindi ang erosyon?<br>*1 = Mahina*<br>*2 = Katamtaman*<br>*3 = Sobra* | | | | |
| 7.2 Gumamit na ba kayo ng mga pamamaraan upang makontrol ang erosyon?<br>Kung oo, anu-ano?<br>Kung hindi, bakit? | ☐ Oo<br>☐ Hindi<br>____________<br>____________<br>____________ | ☐ Oo<br>☐ Hindi<br>____________<br>____________<br>____________ | ☐ Oo<br>☐ Hindi<br>____________<br>____________<br>____________ | ☐ Oo<br>☐ Hindi<br>____________<br>____________<br>____________ |
| 7.3 Saan ninyo natutunan ang mga pamamaraan na nabanggit?<br>*1 = Sarili; 2 = ISF (Integrated Social Forestry); 3 = IRRI (International Rice Research Institute); 4 = ICRAF (International Centre for Research in Agroforestry); 5 = Farmer leader; 6 = Kapwa magsasaka; 7 = Iba pa* | | | | |

B6. Sa nakaraang anim na buwan, ibigay ang porsiyento ng gamit sa lupa.

| Gamit sa lupa | Parsela 1 | Parsela 2 | Parsela 3 | Parsela 4 |
|---|---|---|---|---|
| Mais | | | | |
| Palay | | | | |
| Kamoteng kahoy | | | | |
| Kamoteng bagin | | | | |
| Gulay | | | | |
| Prutas | | | | |
| Bakante (fallow) | | | | |
| Pastulan | | | | |
| Iba pa ________________ | | | | |

**C. Pananaw, Kaalaman at Paggamit ng Impormasyon sa Pana-panahong Abiso sa Klima**

C1. Ang lagay ng panahon o klima ba ay isinasaalang-alang ninyo sa pagpa-plano at pagde-desisyon ukol sa pagsasaka?
[ ] Oo [ ] Hindi

Kung oo, gaano ka-importante ito sa inyong kabuhayan/pagsasaka?
[ ] mababa [ ] katamtamam [ ] mataas

Kung hindi, bakit?
______________________________________________________________

C2. Makakatulong ba ang maagang impormasyon sa panahon sa inyong pagde-desisyon?
[ ] Oo [ ] Hindi

Kung oo, paano? ______________________________________________________

Kung hindi, bakit? ____________________________________________________

C3. Anu-ano ang inyong pinagkukunan ng impormasyon tungkol sa klima/panahon?
[ ] Radyo [ ] Istasyon ng PAGASA
[ ] Telebisyon [ ] Mga sinauna at katutubong paniniwala/kaalaman

[ ] Pahayagan
[ ] *Technician*
[ ] Kapwa magsasaka
[ ] Iba pa ________________________

C4. Kuntento ba kayo sa impormasyong natatangap? [ ] Oo [ ] Hindi

C4.1. Sapat ba ang ibinibigay nilang impormasyon? [ ] Oo [ ] Hindi

C4.1.1. Ano pang impormasyon tungkol sa klima o lagay ng panahon ang kailangan ninyo?
__________________________________________________________________________

C4.2. Tama ba ang impormasyong inyong natatanggap? [ ] Oo [ ] Hindi

Kung oo, paano? ____________________________________________________________

Kung hindi, bakit? ___________________________________________________________

C5. Gaano kahalaga ang natatanggap ninyong impormasyon sa klima pagdating sa pagde-desisyon sa pagsasaka?
[ ] napaka-halaga
[ ] medyo mahalaga
[ ] mahalaga
[ ] konting halaga
[ ] hindi mahalaga

C6. Narinig ninyo na ba ang abiso ng PAGASA tungkol sa Pana-panahong Abiso sa Klima (SCF) tulad ng El Niño at La Niña? [ ] Oo [ ] Hindi

Kung oo, tiwala ba kayo sa ganitong abiso? [ ] Oo [ ] Hindi

Kung hindi, bakit? ___________________________________________

C7. Alam ninyo ba ang mga sumusunod na produkto o serbisyo ng PAGASA?

| Produkto/Serbisyo | Oo/Hindi | *Usefulness Rating* | *Reliability Rating* |
|---|---|---|---|
| Monthly Weather Situation and Outlook | | | |
| Annual Seasonal Climate Forecasts | | | |
| El Nino/La Nina Advisory | | | |
| Tropical Cyclone Warning | | | |
| 10-Day Regional Agri-weather and Advisories | | | |
| Farm Weather Forecasts and Advisories | | | |
| Phil Agroclimatic Review and Outlook | | | |
| Press Release on Significant Weather/Climate Events | | | |
| Phil Agri-weather Forecasts | | | |
| Climate Impact Assessment Bulletin for Agriculture | | | |

*Usefulness rating: 1 = not useful; 2 = somewhat useful; 3 = useful; 4 = highly useful; 5 = vital*
*Reliability rating: 1 = unreliable; 2 = somewhat reliable; 3 = reliable; 4 = excellent*

C8. Sagutin kung sang-ayon, hindi sang-ayon o hindi alam ang sumusunod na mga pangungusap.

| Pangungusap | Oo | Hindi | Hindi alam |
|---|---|---|---|
| Ang klima ang pangkalahatan at pang-matagalang tema ng panahon sa isang lugar. | | | |
| Ang klima ay sanhi ng di-kasiguraduhan sa pagsasaka. | | | |
| Ang Pana-panahong Abiso sa Klima (SCF) ay maaaring magsilbing gabay sa pagde-desisyon ukol sa pagtatanim at pagsasaka. | | | |
| Ang Pana-panahong Abiso sa Klima (SCF) ay mahalagang impormasyon para sa mga desisyon ukol sa pangangasiwa ng mga tanim. | | | |
| Ang tamang abiso sa panahon ay makababawas ng agam-agam dulot ng pabago-bagong lagay panahon. | | | |
| Hindi dapat isaalang-alang ang abiso sa panahon sa mga desisyon sa pagtatanim/pagsasaka. | | | |
| Ang Pana-panahong Abiso sa Klima (SCF) ay mahalaga dahil ipinaaalam nito kung kailan ang simula at gaano kadami ang darating na ulan sa tag-araw/tag-ulan. | | | |

| Pangungusap | Oo | Hindi | Hindi alam |
|---|---|---|---|
| Ang Pana-panahong Abiso sa Klima (SCF) ay makakatulong upang malaman kung maaaring magkaroon ng sakuna tulad ng pagguho ng lupa, baha o tag-tuyot. | | | |

C9. Pananaw ng magsasaka sa impormasyon tungkol sa klima o lagay ng panahon

C9.1. Maaasahan ba ang buhos ng ulan noong nakaraang taniman
[ ] di-maaasahan
[ ] medyo hindi maasahan
[ ] maasahan
[ ] medyo maasahan
[ ] talagang maaasahan

C9.2. Limit o dalas ng tag-tuyot
[ ] Nagkakaroon ng tag-tuyot tuwing 2 taon
[ ] Nagkakaroon ng tag-tuyot tuwing 5 taon
[ ] Nagkakaroon ng tag-tuyot tuwing 10 taon
[ ] Nagkakaroon ng tag-tuyot tuwing 15 taon
[ ] Nagkakaroon ng tag-tuyot tuwing 20 taon

C9.3. Epekto ng panahunang pag-ulan sa pagtatanim
[ ] mahina
[ ] medyo mahina
[ ] katamtaman
[ ] matindi

## D. *Farmers' Attitudes Toward Risk*

D1. Sa inyong kaalaman at tantiya, ano ang magiging tema ng panahon ngayong darating na tag-ulan? Gamit ang 12 na bato, itaya kung ang limit at dami ng ulan ay magiging normal (N), mababa sa normal (B) o mataas sa normal (A)

| Lagay ng Panahon o Klima | Prediksyon (Bilang ng mga bato) | *Probabilidad* |
|---|---|---|
| Mataas sa normal (A) | | |
| Normal (N) | | |
| Mababa sa normal (B) | | |

D2. Ano ang inyong pipiliin?
[ ] Mababa o katamtamang ani pero sigurado.
[ ] May posibilidad na malaking ani depende sa lagay ng panahon.

D3. Sagutin kung sang-ayon, hindi sang-ayon o hindi alam ang mga sumusunod:

| Pangungusap | Oo | Hindi | Hindi alam |
|---|---|---|---|
| Tatanggapin ko ang posibilidad na masira ang pananim dahil sa pabago-bagong panahon kung ang kapalit ay mas malaking kita. | | | |
| Hindi na ako magtatanim kung hindi maganda ang abiso sa darating na panahon. | | | |
| Mas gusto ko ang konserbatibong o katamtamang ani basta maaasahan ang abiso sa panahon. | | | |

**E. Mga Pangunahing Desisyon sa Pagtatanim/Pagsasaka na Naaapektuhan ng Klima o Lagay ng Panahon**

E1. Anu-ano ang mga isinasaalang-alang ninyo sa inyong mga desisyon sa pagtatanim?
[ ] kapital/pondo
[ ] gastos sa binhi, abono at pamatay-peste
[ ] presyo ng mais
[ ] impormasyon sa klima o lagay ng panahon
[ ] iba pa ________________________________________

E2. Anu-ano ang mga pangunahing desisyon sa pagsasaka ang apektado ng pabago-bagong panahon?
[ ] klase ng itatanim
[ ] kailan magtatanim
[ ] kapital/pondo na ilalaan
[ ] iba pa________________________________________

E3. Anu-ano ang mga pangunahing desisyon sa pagsasaka ang apektado ng pana-panahong abiso sa klima?
[ ] klase ng itatanim
[ ] kailan magtatanim
[ ] kapital/ pondo na ilalaan
[ ] iba pa ________________________________________

E4. Anu-ano ang mga pangunahing desisyon sa pagtatanim ng mais ang apektado ng pana-panahong abiso sa klima?
[ ] binhi/*barayti* ng mais na itatanim
[ ] dami ng *inputs* na gagamitin
[ ] iba pa __________________________________________

E5. Base sa inyong mga desisyon sa pagtatanim ng mais, pagsunud-sunurin o i-ranggo ang mga sumusunod na impormasyon sa pana-panahong abiso sa klima ayon sa kanilang importansya o kahalagahan.

| Impormasyon sa Pana-panahong Abiso sa Klima | Ranggo |
|---|---|
| Umpisang petsa ng tag-ulan | |
| Dami ng ulan sa isang lugar | |
| Katapusan o haba ng tag-ulan | |
| Tantiyang bilang ng araw ng ulan | |
| Iba pa | |

**F. Mga Sinauna at Katutubong Kaalaman ng mga Magsasaka Ukol sa Abiso sa Klima**

F1. Mayroon ba kayong mga palatandaan/hudyat/senyales upang masabi na mas magiging tuyo o maulan ang darating na panahon? [ ] Oo [ ] Hindi

Kung oo, anu-ano ang mga ito? ________________________________________________________________________

______________________________________________________________________

F2. Mayroon ba kayong tinitingnan na palatandaan/hudyat/senyales bago simulan ang mga sumusunod na operasyon sa pagsasaka?

| Operasyon sa Pagsasaka | Palatandaan/Hudyat/Senyales |
|---|---|
| 1. Pagbubungkal ng lupa | |
| 2. Pagtatanim | |
| 3. Pag-aani | |

| | |
|---|---|
| | |
| 4. Iba pang mga operasyon<br>_________________________<br>_________________________<br>_________________________<br>_________________________ | |

F3. Mayroon ba kayong mga pamahiin o paniniwala na nagsasabing malas o suwerte na mag-araro, magtanim o mag-ani?
[ ] Oo [ ] Hindi

Kung oo, anu-ano ang mga ito? ___________________________________________________________________

___________________________________________________________________

F4. Gaano maaasahan ang inyong tradisyunal na mga paraan ng pagtaya ng panahon?
[ ] hindi maaasahan [ ] maaasahan [ ] talagang maaasahan

**G.** ***Mitigation Measures and Risk Coping Mechanisms of Farmers***

G1. Mayroon ba kayong ginagawang mga pamamaraan upang maibsan ang masamang epekto ng bagyo, baha at tag-tuyot?

| Kalamidad | *Mitigating Measures* | |
|---|---|---|
| | Sinauna at mga Katutubong Kaalaman | Makabagong Teknolohiya |
| Tag-tuyot | | |
| Baha | | |
| Bagyo | | |

G2. Naranasan na ba ninyo na masiraan ng pananim? [ ] Oo [ ] Hindi

Kung oo, ano ang inyong ginawa upang malampasan ito?
___________________________________________________________________

G3. Mayroon bang mga programa ang pamahalaan na tumutulong sa mga nagtatanim ng mais? (i.e., suportang panteknolohiya, kredit o suportang pinansyal, atbp.)

G4. Mayroon ba kayong crop insurance?

## H. *Input Data for Farm/Field Decision Models*

H1. Pagtatanim noong mga nakalipas na taniman

H1.1. Ibigay ang mga detalye tungkol sa inyong pagsasaka ng mais noong mga nakalipas na taniman.

| Item | Parsela 1 | Parsela 2 | Parsela 3 | Parsela 4 |
|---|---|---|---|---|
| *Nakalipas na tag-ulan (May-July 2005):* | | | | |
| 1. Umpisa ng pagtatanim | | | | |
| 2. Ektarya ng lupang tinaniman ng mais | | | | |
| 3. Binhi/barayti ng mais na ginamit | | | | |
| 4. Petsa ng Ani | | | | |
| 5. Bilang ng ani (kilo) | | | | |
| | | | | |
| *Nakalipas na taniman o tag-araw (Sept.-Dec. 2005):* | | | | |
| 1. Umpisa ng pagtatanim | | | | |
| 2. Ektarya ng lupang tinaniman ng mais | | | | |
| 3. Binhi/barayti ng mais na ginamit | | | | |
| 4. Paraan ng pagbungkal ng lupa **a**/ | | | | |
| 5. Paraan ng pagtanim **b**/ | | | | |
| 6. Distribusyon ng pagtatanim **c**/ | | | | |
| 7. Agwat ng mga row (sentimetro) | | | | |
| 8. Row direction, degrees from North (opsyunal) | | | | |
| 9. Lalim ng tanim (sentimetro) | | | | |
| 10. Klase ng lupa (opsyunal) | | | | |
| 11. Pagdadamo **d**/ | | | | |
| 12.1. Problema sa peste at sakit **e**/<br>12.2. Pagkontrol na ginamit **f**/ | | | | |
| 13.1. Gumamit ng inorganic na abono? (Oo/Hindi)<br>13.2. Kung oo, ano ang uri ng abono at pamamaraan na ginamit? | | | | |
| 14.1. Naglagay ng dumi ng hayop? (Oo/Hindi)<br>14.2. Kung oo, saan galling? | | | | |
| 15. Pag-araro sa lupa ng legumbre? (Oo/Hindi) | | | | |
| 16. Ibinabalik ba ang pinaganihan sa lupa? (Oo/Hindi) | | | | |
| 17. Umupa ng patrabaho o hayop? (Oo/Hindi) | | | | |
| 18. Petsa ng ani | | | | |
| 19. Bilang ng ani (kilo) | | | | |
| 19.1. Bilang ng naibenta (kilo) | | | | |
| 19.2. Dami ng pangbinhi para sa susunod na taniman | | | | |
| 19.3. Dami ng pangkain | | | | |
| 19.4. Dami ng ipinamigay | | | | |
| 20. Lugar ng benta **g/** | | | | |
| 21. Presyo ng ibinentang mais (PhP/kg) | | | | |
| 22. Gastos sa pagbiyahe ng produkto (PhP) | | | | |
| 23. Kabuuang kita | | | | |

a/ 1 = Zero tillage (hindi pagbubungkal); 2 = Burning (pagsunog); 3 = Clearing (pagtabas o linis); 4 = Up and down plowing; 5 = Straight plowing; 6 = Contour plowing; 7 = Other (iba pa)

b/ 1 = Dry seed (diretsong tanim); 2 = Nursery (punla); 3 = Pre-germinated seed (pagpapasibol); 4 = Ratoon; 5 = Transplants (lipat-tanim); 6 = Others (iba pa)

c/ 1 = Hills (tudling); 2 = Rows (pagitan ng tudling); 3 = Uniform/broadcast (sabog); 4 = Other (iba pa)

d/ 1 = None (wala); 2 = Handweeding (pagbunot ng damo); 3 = Hoe; 4 = Plowing (pag-araro); 5 = Other (iba pa)

e/ 1 = None (wala); 2 = Slight (mahina); 3 = Moderate (katamtaman); 4 = Severe (matindi)

f/ 1 = None (wala); 2 = Chemical spray (kemikal); 3 = Biological control (bayolohikal/paggamit ng ibang halaman at insekto); 4 = Physical control (pisikal na pagtanggal); 5 = Combination (kombinasyon); 6 = Others (iba pa)

g/ 1= Barangay; 2 = Town (bayan); c = Nearby City (Kalapit na lungsod/siyudad)

H1.2. Base sa pinakamalaking lote ng lupa na inyong sinasaka, estimahin ang dami ng patrabaho (labor) na inyong kinailangan sa pagtatanim ng mais.

.

(Bilang ng parsela: ___________ Ektarya: ___________)

| Operasyon | Man-Day (MD) | | | Man-Animal-Day (MAD) | | | Animal-Day (AD) |
|---|---|---|---|---|---|---|---|
| | FL | HL | BL | FL | HL | BL | |
| Pagbubungkal ng lupa | | | | | | | |
| • Plowing (Pag-aararo) | | | | | | | |
| • Clearing (Paglilinis) | | | | | | | |
| • Harrowing (Pagsuyod) | | | | | | | |
| • Furrowing (Pagtutudling) | | | | | | | |
| Pagtatanim ng mais | | | | | | | |
| Paglalagay ng abono sa pagtatanim | | | | | | | |
| Pag-uulit-tanim | | | | | | | |
| Paglalagay ng abono | | | | | | | |
| Pagasampay | | | | | | | |
| Pagdadamo | | | | | | | |
| Pagkontrol sa peste | | | | | | | |
| Iba pang pangangalaga sa tanim | | | | | | | |
| Pag-ani | | | | | | | |
| Proseso matapos ang anihan | | | | | | | |
| Iba pa ___________ | | | | | | | |

FL = Family labor (Pamilya); HL = Hired labor (Patrabaho/upahan); BL = Bayanihan labor (Bayanihan/tulungan)

H1.3. Ibigay ang halaga ng ginastos sa patrabaho (labor) noong nakaraang taniman (Sept-Dec 2005).

| Item | Sahod |
|---|---|
| Magkano ang ibinayad ninyo sa patrabaho sa bukid? (PhP/MD) | |
| Magkano ang nagastos sa pagkain, sigarilyo atbp. habang nagpapatrabaho? (PhP/MD) | |
| Magkano ang inyong kikitain kung magtatrabaho kayo sa ibang bukid? (PhP/MD) | |
| Magkano ang ibinayad ninyo sa kalabaw at operator? (PhP/MAD) | |
| Magkano ang ibinayad ninyong renta sa kalabaw/baka? (PhP/AD) | |

H1.4. Gamit ang pinakamalaking lote ng lupang inyong sinasaka, estimahin ang iba pang mga gastusin sa pagtatanim ng mais.

(Bilang ng parsela: ___________ Ektarya: ___________)

| Abono/Pestisidyo/ Iba pa | Presyo bawat unit | Dami ng na-gamit | Kabuuang bilang ng binili | Buwan ng pagbili | Lugar na pinag-bilhan | Kabuuang gastos sa transpo-rtasyon sa pagbili ng mga inputs (balikan) | Kabuuang gastos | Cash or Credit | Pinag-mulan ng input |
|---|---|---|---|---|---|---|---|---|---|
| Binhi (kilo) | | | | | | | | | |
| Urea (46-0-0), kg | | | | | | | | | |
| Complete (14-14-14), kg | | | | | | | | | |
| Ammonium Sulphate (21-0-0), kg | | | | | | | | | |
| Ammonium Phosphate (16-20-0), kg | | | | | | | | | |
| Solophos (0-18-0), kg | | | | | | | | | |
| Muriate of Potash (0-0-50), kg | | | | | | | | | |
| Dumi ng hayop (kilo) | | | | | | | | | |
| Iba pang abono (kilo) | | | | | | | | | |
| Pesticide/ Pamatay peste (litro) | | | | | | | | | |
| Herbicide/Pamatay sa damo (litro) | | | | | | | | | |
| Iba pa ______________________ ______ | | | | | | | | | |

H2. Balak sa darating o kasalukuyang taniman

H2.1. Magtatanim ba kayo ng mais sa darating na tag-ulan? [ ] Oo [ ] Hindi

H2.2. Klase ng binhi na itatanim at panahon ng pagtatanim at pag-aani.

| Item | Parsela 1 | Parsela 2 | Parsela 3 | Parsela 4 |
|---|---|---|---|---|
| 1. Binhi na itatanim | | | | |
| 2. Kailan magtatanim | | | | |
| 3. Laki ng lupa na tataniman | | | | |
| 4. Kailan mag-aani | | | | |

*Maraming salamat sa inyong kooperasyon!*