Philipp J Crop Sci 2001, 26(1): 5-14
Released March 2003

TRADITIONAL WEATHER FORECASTING METHODS IN ILOCOS NORTE

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The traditional weather forecasting methods (weather lore) used by the weather-wise folk as guide in their farming and fishing activities and for self-help disaster preparedness were documented. Weather-wise folk from the remote barangays of 19 municipalities of Ilocos Norte had almost similar indicators for the onset of rainy season or occurrence of adverse weather conditions.

Accordingly, the unusual behavior of ants, earthworms, dragonflies, dogs, frogs and birds like the Himalayan swiftlet, lesser caucal, plaintive cuckoo, heron or honeybees usually predict an upcoming rain, typhoon or bad weather. The ripening and shedding of fruits of plants such as physic nut, bangkal, and siniguelas are also indicators of the onset of the rainy season. A long parallel band of feathery clouds, and moon with ring are also important clues to predict weather. To the fisher folk, the visible seawater evaporation and high seawaves are the most preferred indicators.

These traditional weather predictors have been used by farmers and fishers for many years as handed down to most of them by their forefathers. These weather lore are more preferred than the information provided by PAGASA which to them is oftentimes too general to be of practical help.

Key words: weather lore, animal behavior, meteorology, almanac, atmospheric indicators, astronomic indicators, clouds, seawaves, rainbow, lunar corona, plant phenology

INTRODUCTION

Weather forecasting is indispensable to the farmers of the Ilocos Region. Knowledge of the imminent coming of the rainfall season is very important especially in areas that depend substantially on rainfed farming because the farmers will then know it is time to sow their seeds. Predictions of adverse weather conditions, on the other hand, admonish farmers and thus, great losses in production especially rice and cash crops can be prevented. It has been their common experience that if rice is planted too early or too late, grain filling and harvesting are affected by water stress, heavy rains or typhoons. In turn, cash crops planted after rice are adversely affected. Fruit growers, fishermen and ordinary individuals share similar experiences.

Ilocano weather-wise folk have depended upon close observation of nature to forecast both short and long range changes in weather called **weather lore**. These lore have been preserved and transferred to generations and farmers still rely on them despite the availability of weather forecasts and information from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) stations in Batac and Laoag in Ilocos Norte. Farmers claim the PAGASA forecasts are too general, that a location-specific forecast is more preferred, and so they cling to their lore.

Most educated people would dismiss old-time weather lore as beliefs simply designed to explain mysteries of nature that old folk could not explain any other way. And because there is still no way to say exactly what the weather will be in the next day or months in a specific location, even with the technology we have, weather lore still remains a part of forecasting, It is then essential to understand the perception and categorization of weather of the different cultures in the process of making meteorological information useful. And if daily or seasonal climate can be predicted to a degree that makes it possible to respond appropriately and effectively in the agricultural sector, this would potentially have a major impact on food security.

This study, therefore, attempts to put traditional weather forecasting in Ilocos Norte in a proper scientific footing. Weather lore can serve as a supplement to the public meteorological information from PAGASA in developing a farm weather advisory that can meet the information needs of farmers in planning their farm operations and in establishing cropping calendar. Moreover, the reliable indicators can be important

considerations in developing strategic measures for Ilocos folk to be able to respond to favorable weather conditions or prepare for adverse ones in adequate time.

REVIEW OF RELATED LITERATURE

Rainfall is the most important factor that affects crop production in the Philippines. The establishment of a method in determining whether the rainy season has already set in is vital for farmers as this signals the start of their wet season cropping activities.

Even modern meteorologists point to tradition when it comes to weather forecasting. IDRC (Reports Vol. 21 1993) cited indigenous and traditional knowledge as part in successfully addressing issues of sustainable development. It is emphasized that the indigenous peoples were the original practitioners of sustainable development, applying time-tested practices to establish an ecological balance with their environment. Fagi and Las (1987) reported that Indonesia adapted a combination of traditional and modern technologies which helped boost rice production.


Encarta Encyclopedia, Henry Lansford/Science Source/Photo Researchers, Inc.

Maner and Joyce (1997) opined that experts who forecast weather based on direct observation derive their expertise mainly from the collective experience of persons whose lives and livelihood depend on their ability to predict changing local weather. These include hunters, farmers, sailors, pilots, mountaineers, campers, and persons living permanently in the back country. Fortunately many of their insights have been passed from one generation to the next as weather lore and collected in various weather almanacs. According to the American Heritage Dictionary of the English Language, an *almanac is an annual publication including calendars with weather forecasts, astronomical information, tide tables and other related information.* The oldest farmer's almanac in the United States is *The Old Farmer's Almanac*; an excerpt from the latest available issue is instructive (Hale, 2000):

> *We derive our weather forecasts from a secret formula devised by the founder of this Almanac in 1792, enhanced by the most modern scientific calculations based on solar activity and current meteorological data. We believe that nothing in the universe occurs haphazardly but that there is a cause-and-effect pattern to all phenomena, thus making long-range weather forecasts possible. However, neither we nor anyone else has as yet gained sufficient insight into the mysteries of the universe to predict weather with anything resembling total accuracy.*

Charles Wax, head of the geosciences department at Mississippi State University and the state's designated meteorologists, pointed out that weather lore remains a part of forecasting and that everyday events can offer weather-related tips.

Not all weather lore or predictions are correct, but many indeed have a basis in scientific fact. Battan (1979) cited that the clouds indicate the prevailing and past conditions in the air and, more importantly, the probable future atmospheric conditions. For making short-period forecasts from local observations alone, clouds are one of the two most important criteria available (wind direction is the other criterion). It is also believed that "reading the clouds" still requires a skilled human observer. Satellite pictures can give a synoptic view and weather radar can distinguish between ice crystals and ordinary moisture, but only human observers can distinguish between cirrostratus and cirrocumulus. (Maner 1997).

The sea itself can give evidence of weather changes, for an incoming gale can set up a rolling swell, distinct from the waves, which travels rapidly ahead of a storm into an area that is still calm and gives warning of worsening weather before the clouds begin to gather or the barometer to fall (Encyclopedia Britannica, 15th Edition).

Weather lore is also based on observation of the environment and the effects that weather changes have on insects, animals, birds and people. Because the instincts of plants and animals tend to integrate many environmental factors, studies of phenological phenomena could be important in improving the prognostic criteria for weather forecasting (Fagi and Las 1987). The Ibanags of Cagayan Province, Gaddangs and Bugkalots of Nueva Vizcaya, Negritos of Luzon and Ivatans of the Batanes islands were able to develop adaptive measures in coping with adverse weather condition because of their indigenous predictions. Their indicators include the unusual behavior of insects, birds and animals, appearance of the sky and clouds and phenology of plants (Cayabyab et al 1998, Tayag et al 1998).

Table 1. Demographic profile of the informants.

Characteristics	Frequency (N=204)	Percentage
Age		
60-70	108	53
71-80	69	34
81 and above	27	13
Sex		
Female	39	19
Male	165	81
Years of residency		
10-30	17	8
31-50	21	10
51-70	79	39
71 & above	87	43
Occupation		
Farming	159	78
Housekeeping	39	19
Others	6	3
Number of years of farming		
10-30	14	7
31-50	91	46
51-70	87	44
71 & above	7	3
Educational attainment		
None	23	11
Elementary	144	71
High school	31	15
College level	6	3

METHODOLOGY

Locale of the study

The study was conducted in remote barangays of 19 municipalities of Ilocos Norte (Fig 1). The province of Ilocos Norte is located some 471 km north of Manila.

Rainfall distribution in Ilocos Norte is so scattered that public forecasts from PAGASA cannot be always relied upon. At one time, heavy rainfall might be occurring in some areas while the rest do not receive any rainfall at all. A survey was done to document the weather forecasting methods traditionally used by Ilocos folk.

Informants of the study

The Municipal Agricultural Officers (MAOs) were consulted to help identify farmer and fisher folk in remote barangays who were 60 years old and above. Purposive sampling was employed in choosing the informants. The key informants were believed to have significant knowledge or information on traditional weather forecasting. A total of 204 key informants comprising of farmers, housewives and fisherfolk served as informants. Majority of the informants belong to the age bracket 60 to 70 years; most of them were elementary graduates while some finished high school; the rest did not have formal schooling. Most of the informants have been farmers from 31 to 50 years (78%), housekeepers (19%) who share with light work in the farm and fishing folk (3%). Informants have been residing in their respective places since birth; 43 percent have been in that place for more than 71 years (Table 1).

Data/information gathering

The informants were personally interviewed with the aid of an unstructured questionnaire. Informants were asked about the indicators they use as bases or clues of the onset of rainfall, upcoming rain or adverse weather conditions. Also, they were asked to describe and explain some unfamiliar terms related to plants, birds, insects, among others, for commonality of terms and interpretation. Other information gathered included their demographic profile and the informants' adaptive measures of coping with typhoon or flood.

Internet facilities and library resources were used as references/sources of scientific explanations of the documented indicators in weather prediction.

Data analysis

Results of the interview were transcribed for further verification. Qualitative and descriptive statistics such as frequency, percentage and ranking were used to analyze the data gathered.

RESULTS AND DISCUSSION

Informants indicated a total of 66 weather lore; these lore are grouped into: atmospheric/astronomic phenomena indicators, phenology of plants, and animal/insect behaviors. These indicators were further classified as to the type of forecast that each would predict: seasonal climate forecast (forecast for the next few months), short-range forecast (forecast for the next few days) or daily rainfall and occurrence of adverse weather conditions, ie, storm or flood (Table 2). Of the informants, 107 rely on a combination of atmospheric phenomena, animal behavior and phenology of plants, 50 turn to animal behavior and phenology of plants, 20 trust animal behavior and atmospheric phenomena as reliable indicators, while the rest either rely on plant behavior or atmospheric phenomena alone in predicting the weather.

The most commonly mentioned indicators were: the color and type of clouds, appearance of the sky, wind direction, phases of the moon, appearance of the sea, animal/insect behavior, and phenology of plants or reaction of plants to weather changes. Interestingly, the atmospheric and astronomic phenomena are factors considered by modern meteorological services in developing a statistically based weather forecast.

Table 2 Atmospheric and astronomic phenomena used as indicators by Ilocano weather-wise folk and their perceived degree of reliability in predicting the weather

Indicators	Frequency[a]	Type Of Forecast	Perceived Degree Of Reliability	
			High	Moderate
Sea				
o Visible sea water evaporation	35	C	34	1
o Intense thunderstorm is heard in the sea	21	C	21	
o Sea roars	15	C	13	2
o High sea waves	4	C	4	
o Cloudy in southern part of the sea	1	C	1	
o Wind comes from the north of the sea	1	C	1	
Clouds				
o Long parallel band of feathery clouds	38	C	33	5
o Red sky during sunrise	18	B	18	
o Very warm night and day	17	B	16	1
o Clouds in vertical position in the west at dawn	11	B	10	1
o Cloudy in the East	6	B	6	
o Clouds block sun at sunrise	3	B	3	
Rainbow				
o Rainbow appears in the morning and is elliptic	12	B	11	1
o Rainbow disappears, clouds come out	8	B	8	
Moon				
o Luminous ring around the moon (lunar corona)	55	C	51	4
o Crescent moon is tipped on its side (horns pointing up)	29	B	27	2
o Moon/stars seen dimly	3	B	3	
Wind				
o Wind comes from South	1	C	1	

[a] *Multiple responses*

Type of forecast: A – seasonal (onset of rainy season), B – short-range (upcoming rain), C – adverse weather condition (typhoon or flood)

Atmospheric and astronomic indicators

These indicators can be used to predict seasonal and short-range forecasts, and adverse weather conditions. Thus:

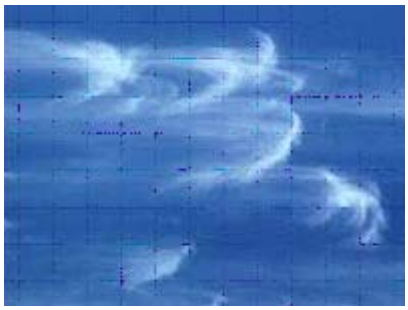
Appearance of clouds or sky and direction of wind and humidity. The folk predict rain when clouds near the sun appear to be red during sunrise. Literature explains that a red sky in the morning is due to the sun shining through dust. In this case, however, the dust is being pushed on out by an approaching low pressure system bringing in moisture. Some informants also observed that when it is cloudy in the east or in the west at dawn, ie, the clouds appear to be heavy and dense, with a considerable vertical extent, in the form of mountain or huge towers (cumulonimbus clouds), there will be rain. The same is predicted when the moon and stars can be seen dimly. According to Critchfield (1983), the cumulonimbus is the great thundercloud. It always produces at least a pronounced shower. Also, the stars and moon can be seen dimly due to the altostratus cloud which is a grayish or bluish cloud sheet, totally or partly covering the sky, and having parts thin enough to reveal the sun at least vaguely as through ground glass. Informants observed that when the temperature during daytime and nighttime is very warm, rain will come in a day or two.

Most of the informants claim that a good indicator of an approaching storm is the long parallel band of feathery clouds (clouds having a hair-like appearance called *cirrus*) (Template No. 1). Liwag (1992) pointed out that if the cirrus clouds are observed converging towards a point in the horizon, then a storm is present in that direction. A storm has a low pressure at its center, which whips up the surface winds to spiral violently towards its center. On top of the storm, however, the winds are coming out or diverging from its low pressure center. The cirrus clouds manifest this divergence in the upper level. If the sky is clear and blue, these feathery clouds will soon disappear in few hours. But if the sky is grayish the cirrus will thicken and spread to form cirrostratus or are replaced by clouds in sequence of decreasing altitude, then a storm is intensifying and definitely approaching. Informants residing near the

sea indicated that when the sky in the western part of the sea is cloudy or the winds tend to come from the north of the sea, a typhoon or storm is imminent.

The informants observed the sea, clouds, rainbow, moon and wind. In perceived degree of reliability, the informants overwhelmingly gave the rating *High* and only a handful the rating *Moderate* on their weather forecast based on such atmospheric or astronomic phenomena they had studied. The most used phenomenon was the lunar corona (55 informants), followed by feathery or cirrus clouds (38 informants), then by the visible evaporation of sea water (35 informants).

Rainbow, phase and appearance of moon. Informants mentioned that the appearance of rainbow and moon are good indicators of an upcoming rain. When a rainbow disappears as clouds come out or when a rainbow in the west is elliptic and appears in the morning, rain will come soon. Some informants also noted that when the crescent moon is tipped on its side, there will still be rain (Template No. 1). Weather-wise folk are able to foretell the presence of a distant storm even on sunny days. After several careful observations, whenever a ring (corona) around the moon is observed, bad weather usually follows in a day or two (Template No. 1). The informants stressed that when the diameter of the corona is small, a storm is near but whenever the diameter of the corona is larger than usual, a weather disturbance is occurring but is far from the locality. Coronas, according to Battan (1979), are a result of a process called diffraction by which a beam of light spreads into the region behind an obstacle. The light waves coming from the moon toward the observer are slightly bent around the droplets. The light waves deviated by many droplets interfere with one another on the observer's side of the droplets and the result is a concentration of light in a circle around the moon. The radius of the corona is inversely proportional to the size of the water drops, which means that a small corona indicates large drops – the more humid the air, the larger the droplets. Critchfield (1983) opined that all the clouds of the cirrus or cirro type are composed of ice crystals through which the sun or moon shines and thus, produces a halo. Liwag (1992) explained that halos are due to the refraction of light through ice crystals, and these are seen when a cirrostratus covers the sun or moon. A cirrostratus is a whitish cloud veil of fibrous or smooth appearance, total or partly covering the sky, and generally producing the halo phenomenon. This may signal the approach of a storm and more often than not, precipitation follows.



Roaring and giant waves in the sea. Informants residing in the coastal areas anticipate an incoming bad weather or distant atmospheric disturbance when some changes/irregularities on the appearance of the sea are observed. Visible seawater evaporation (Template No. 1) was mentioned mostly by the informants as an indicator. When the sea roars, high seawaves or giant waves are seen and an intense thunderstorm is heard from a distance in the sea, storm is sure to occur. Liwag (1992) cited that in regions where there are large and warm oceanic areas, tropical cyclones form. They begin as low pressure center over an ocean or large bodies of water with strong circulating winds, so giant waves and phenomenal seas whipped up by violent winds spiraling around the storm's center are brought to distant shores. These irregularities are caused by a chain reaction from the immense surface circulation of a storm especially if it is still over the sea.

Plant indicators

Phenology of Plants. Often cited by the informants as reliable indicators that are likely to predict a wet/dry year associated with a good/bad harvest are the phenology of plants (Table 3). Farmers cannot ignore these indicators in planning and developing their cropping activities. According to the informants, the wet season begins when fruits of the physic nut, *bangkal*, and *siniguelas* start to ripen or shed. Most of the respondents mentioned *bangkal* (*bulla*) and physic nut (Template No. 2) as reliable indicators, followed by the *siniguelas*, *bignay*, and *ducat*. The informants said that sometimes they could hardly detect if it is already the planting season or not yet because a dry spell often occurs without them knowing it like the occurrence of El Niño. However, they noted that fruits ripen or rot faster when the rainy season has already set-in. This phenomenon is attested by the observation of Acer on the growth and reproduction of *Anthrop carcass.* It was reported that the flowering of the physic nut tends to be episodic and responds to variation in rainfall. It is a common knowledge that plants do react to changes in weather.

It was also claimed that some plants form buds/shoots/blooms before a bad weather. Of the (mentioned by 69 informants), followed by the *tawwa alad* (63 informants), then by the bamboo (48 informants).

Table 3 Specifics of phenology of plants used as indicators by Ilocano weather-wise folk and their perceived degree of reliability in predicting the weather

Indicators	Frequency[a]	Type Of Forecast	Perceived Degree Of Reliability	
			High	Moderate
Fruits ripen/rot early				
o Bangkal (*Bulala*), *Nuclea orientalis*	69	A	64	5
o Physic nut (*Tawwa alad*), *Jathropa curcas*	63	A	60	3
o Siniguelas (*Sarguelas*), *Spondias purpurea*	28	A	27	1
o Bignai (*Bugnay*), *Antidesma bunius*	11	A	10	1
o Kamachile (*Damortis*), *Pithecolobium dulce*	6	A	5	1
o Duhat (*Lomboy*), *Zyzygium cumini*	6	A	5	1
Buds/shoots/blooms form				
o Bamboo (*Kawayan*),	48	B	45	3
o Karut ( ), *Dioscorea hispida*	14	B	14	
o Siniguelas (*Sarguelas*), *Spondias purpurea*	6	A	6	
Moss grow in abundance in rivers	4	C		4
Plants flower				
o *Balakibok*	2	A	2	
o Bamboo (*Kawayan*)	2	A	2	
o *Talahib* (*Ledda*), *Saccharum spontaneum*	3	A	3	

[a] *Multiple responses*

Type of forecast: A – seasonal (onset of rainy season), B – short-range (upcoming rain), C – adverse weather condition (typhoon or flood)

responses, the most identified plant is the *kawayan* followed by *karat* and *siniguelas*. It was stressed that *balakibok*, *kawayan*, and *ledda* usually bear flowers. When moss grows abundantly in the river, they are sure that a bad weather is approaching.

Again, the informants overwhelmingly declared that they considered the use of plant phenology as highly reliable in predicting the weather. While they may not have heard of the term *phenology*, they knew what they were observing. Thus, the most observed plant was the *bulala*

Animal indicators

Unusual behavior of animals. According to the informants, when armies of ants start migrating to new sites for their colonies, usually evacuating stored foods, or when cicadas, which are not seen during the day, begin their incessant high-pitched droning sound, then the farmers are sure that the wet season is about to start (Table 4). According to the literature, ants and insects are very adept at monitoring atmospheric conditions as their survival depends on it. Also, some birds and bees migrate/fly to the mountains in groups when the rainy season has already set in. These are the heron (*kannaway*), honeybees, and blue-tailed bee eater (*pirpiriw*). Welty (1982) observed that the most obvious and perhaps the most important advantage provided by migration is that a better climate for living is secured. There is also anecdotal evidence that birds register changes in barometric pressure. It is well known that birds show changes in behavior as a weather front approaches. Moreover, birds can detect infrasonic frequencies (at least down to 0.05 Hz). Infrasound can travel many hundreds, even thousands of kilometers, thus allowing birds to orientate to, say distant mountains (via the wind blowing through them) or shorelines (from the sound of breaking waves). It is an accepted fact that sound travels farther in moist air such that the sound of rain precedes the actual rain.

Adult winged termites (*simut-simut*), moths, and May or June beetle (*arus-arus* and *simmawa*) are more earthbound if there is an upcoming rain. Moths and winged termites flutter around light sources especially at night. When dragonflies are flying low, rain is upcoming. This is attributable to a drop in air pressure causing the air to become heavier and resulting in difficulty in higher- altitude flying. Apparently, the high humidity affects their wings which become soggy. It can also be linked to certain birds hunting for insects that are flying lower to the ground for the same "heavy air" reason. Some birds fly low also such as Himalayan swiftlets (*salsallapingaw*) simply because they chase insects and these are at a level near the ground surface at such times (Template No. 3). When rain clouds are approaching, the downward current of air blows insects down from high altitudes. Birds that ordinarily catch insects high in the air now have to follow them close to the ground (Sutton 1987). According to Gonzales and Rees (1988), one of the habits of the Himalayan swiftlet is that it continually flies, ie, is active in the morning and in the afternoon, but may be seen all day when the sky is overcast and often in the company of other swiftlets.

Table 4 Specifics of animal behavior used as indicators by Ilocano weather-wise folk and their perceived degree of reliability in predicting the weather

Indicators	Frequency[a]	Type Of Forecast	Perceived Degree Of Reliability	
			High	Moderate
Insects/birds migrate to mountain				
o Heron (*Kannaway*),	56	A	54	2
o Honeybees, *Apis mellifera*	31	A	31	
o Blue-tailed bee-eater (*Pirpiriw*), *Merops philippinus*	1	A	1	
Mammals				
o Dogs excrete waste middle of road or at higher elevation	86	B	81	5
o Carabaos sneeze	25	B	23	2
o Calves/deer become uneasy	5	B	5	
o Native pigs gather their litter	1	B	1	
Other animals				
o Native frogs croak near swampy areas and hide their egg mass	34	A	31	
o Wasps (*Alumpipinig*) hide their honeycomb	22	C	22	
o Apex of the mound is moist	14	C	13	1
o Chicken stay under shade at noontime and seem like taking a bath with dust	11	B	11	
o Spider spin shorter and have thicker webs	2	B	2	
o				
Crustaceans		C	6	
o native shrimps transfer to creeks	6	C	8	
o female native crabs/goby (bukto) migrate from river to brackish water	8			

[a] *Multiple responses*

Type of forecast: A – seasonal (onset of rainy season), B – short-range (upcoming rain), C – adverse weather condition (typhoon or flood)

Some birds make mournful sounds or seem like crying in trees. These are the lesser caucal (*kakok*), plaintive cuckoo (*pitopit*), *tuwaw* or *pittagaw*, *kuamkuak*, white-throated kingfisher (*salaksak*), large-billed crow (*uwak*), barred rail (*tukling*) (Template No. 4), and others such as the white-collared kingfisher (*tuggaring*) and slaty-breasted rail (*sibeg*). According to Welty (1982), one of the functions of a bird's voice is to announce the bird's emotional state or mood and discharge nervous energy and provide emotional release. Some birds may sing from a sense of well-being or simply "for the joy of it". Rabor (1977) noted that one of the habits of the plaintive cuckoo is that it utters its call late in the day during cloudy and rainy days. The notes resemble the syllables "pee-to-peet" repeated 5 or 6 times. Also, the white-throated kingfishers are noisy when the sky is overcast or when there is light rain. Lesser caucal suns with fluffed feathers atop a grass *tussok*, or the crown of a shrub or bamboo tree after rain (Gonzales and Rees 1988). The white-collared kingfisher can be seen perching on the sand, on rocks and stones, on broken poles that were once fish corals, and other perching places where they can have a good lookout for possible fiddler crabs, fish or shrimp. Rabor (1977) pointed out that when a prey is seen the bird flies down and grabs it with its bill.

Informants recounted that the unusual behavior of mammals would indicate an impending rain. Dogs, for instance, excrete their wastes in the middle of the road or at higher elevation before a storm or an upcoming rain. Stidworthy (1990) explains that scent seems to be a dog's greatest interest and that the feces may be used to proclaim ownership of an area or to leave a message about the one who did it. This dog behavior particularly on those dogs allowed to run loose in town, makes sure that their dung will not be washed out as this will make the marker it leaves behind more obvious. The New Standard Encyclopedia (Vol 3) cited that dogs are much more keenly alert to odors and sounds and hearing is an acute sense among dogs; frequencies up to 35,000 vibrations per second can be detected. Because sound travels farther in moist air, and dogs can probably hear or smell the coming of rain, they can detect far sooner than human the changes in the air and many times become restless with the coming of rain. Other observations gathered in the current study on the unusual behavior of animals included the sneezing of carabaos, uneasiness of calves and deer, and the gathering by native pigs of their litter.

Informants also mentioned that frogs croak near swampy areas before an upcoming rain. This is so because the air is more humid and this allows them to stay. Also, because frogs have a good sense of smell they often locate ponds from miles away (Gordon 1977). Lomarda (1992) pointed out that in fair weather, odors of ponds and ditches are refreshed by descending high air pressure associated with bad weather, which produces updrafts that allow these odors to escape. So just before the rain, our sense of smell too would seem to improve.

When chickens gather under the shade at noontime or seem like taking a bath with dust, an upcoming rain is certain. Some informants also observed that spiders spin shorter and thicker webs before a rain comes.

The informants indicated that typhoon is imminent if the sphecid wasps (*alumpipinig*) hide their honeycomb under the leaves. They believe that when they build their honeycombs on high trees, there is an incoming flood, and if they build them low, there is a strong wind and may be dangerous. Also, the growing mound that becomes moist points to the advent of bad weather. A flood will occur when earthworms come out from the ground and scatter in the streets or paved ways. Informants also claimed that crustaceans like shrimps, crabs and goby seemingly transfer from springs to creeks or jump out of the water before a flood comes. Likewise, female crabs and goby are also observed to migrate from river to brackish water while crabs crawl out of the water to the riverbanks.

As with the other groups of indicators for predicting the weather, the informants overwhelmingly said that the reliability in the use of specific animal behaviors is *High*. The most often-mentioned was dogs defecating in the middle of the road (86 informants)

Importance Of These Traditional Forecasts

Table 5 Importance of these weather forecasts to Ilocano weather-wise folk

Characteristics	Frequency[a] (N=204)	Percentage
Farming Activities		
Land preparation	162	79
Seed preparation	131	64
Repair/prepare farm equipment	17	8
Others	13	6
Personal Safety		
House repair	81	40
Buy/store unperishable foods	69	34
Gather firewood	63	31
Buy candles, batteries or flashlights, fuel, gas	49	24
Mill rice	39	19
Others	12	6
Disaster Preparedness		
Place wind breaks	6	3
Construct canals	5	2
Others	2	1

The majority of the informants use these traditional forecasts as bases in planning and preparing for their farming activities, personal safety, and disaster preparedness (Table 5). With the indicators mentioned, they are given enough time to prepare their land ready for planting rice and other crops before the start of the wet season, repair and clean dikes for better drainage, and prepare their planting materials, ie, cleaning, drying etc. Some informants repair or prepare their farm equipment for the coming planting season.

The indicators of adverse weather conditions such as heavy rains, typhoons or floods, would hint the farmers and fisherfolk to repair their houses, tighten the loosened ceilings or walls, preserve and stockpile food, fuel, gather fire woods and mill rice. Pastures, livestock and poultry, likewise, boats and rafts of fisherfolk could be put in safe shelter or place before the coming of flood or typhoon. Those residing in lower or open areas or coastal areas can put windbreaks.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

By way of summary, the most frequently mentioned indicators of forthcoming weather by the informants were gathered into one separate table and grouped according to whether they are about the onset of the rainy season (A), an upcoming rain (B) or adverse weather conditions coming (C) (Table 5). Thus, it can be seen that:

In predicting the onset of the rainy season (A), most of the informants used the ripening or rotting early of the fruit of bangkal (69) or physic nut (63); others observe the heron migrating to the mountain (56), and still others use the croaking of frogs (34).

In predicting typhoon or flood (C) is the lunar corona (55 informants). Also mentioned as indicator of typhoon or flood upcoming but fewer informants were feathery clouds (38), and sea water evaporation (35).

In predicting rain (B), most weather-wise folk observe dogs excreting in the streets (86 informants), and fewer use the fact that the bamboo would suddenly form buds, shoots or blooms (48).

Ilocos folk have become adept at forecasting the start of the rainy season, the upcoming rain or occurrence of typhoon or flood using different indicators.

While institutional (eg, PAGASA) weather predictions have improved greatly in accuracy over the past years with the advancement of information and technology, weather forecasts still have some limitations. Farmers, fishermen and residents of far-flung barangays of Ilocos Norte need a more specific weather advisory for their farming and fishing activities. However, this kind of service is still lacking so they rely on their traditional methods of forecasting the weather which they claim to be highly reliable.

To date, many people still consider these weather lore as superstitious beliefs or simply nonsense. However, our study on the most common weather lore indicates that indeed have scientific bases.

An offshoot of this study would be to validate the commonly used indicators (Table 6) as to their field reliability in forecasting actual weather. This would provide basis for eventually recommending them as supplement to sophisticated yet limited weather forecasting methods. For policy makers, this could serve as an important aid in making critical decisions and in developing measures to cope with the occurrence of a long dry season brought by the El Niño, or a long wet season like that brought by the La Niña, or devastating floods.

Table 6 The most frequent indicators used by Ilocano weather-wise folk in predicting the weather

Indicators	Frequency[a]	Type Of Forecast
Predicting Onset of Rainy Season		
o Fruit of bangkal (*Bulala*), *Nuclea orientalis* ripen/rot early	69	A
o Fruit of physic nut (*Tawwa alad*), *Jathropa curcas* ripen/rot early	63	A
o Heron (*Kannaway*) migrate to mountain	56	A
o Native frogs croak near swampy areas and hide their egg mass	34	A
o Honeybees, *Apis mellifera* migrate to mountain	31	A
o Siniguelas (*Sarguelas*), *Spondias purpurea* ripen/rot early	28	A
Predicting Upcoming Rain		
o Dogs excrete waste middle of road or at higher elevation	86	B
o Bamboo (*Kawayan*) buds, shoots or blooms form	48	B
o Crescent moon is tipped on its side (horns pointing up)	29	B
o Carabaos sneeze	25	B
Predicting Typhoon or Flood		
o Luminous ring around the moon (lunar corona)	55	C
o Long parallel band of feathery clouds	38	C
o Visible sea water evaporation	35	C
o Wasps (*Alumpipinig*) hide their honeycomb	22	C
o Intense thunderstorm is heard in the sea	21	C

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