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PROGRAMME REVIEW

POVERTY

Developing Climate Services in the Philippines



Richard Ewbank (Climate Advisor)

Developing Climate Services in The Philippines – A Review

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Photographs: Richard Ewbank

iii) Acronyms

CrFS - Climate-resiliency Field School

EWS - Early warning system

FC - forecast

GDP - Gross domestic product

LGU - Local Government Unit

MAO - Municipal Agriculture Office

MDRRMO - Municipal Disaster Risk Reduction Management Office

MPDO - Municipal Planning and Development Office

MT – metric tonnes

PAGASA - Philippine Atmospheric, Geophysical and Astronomical Services Administration

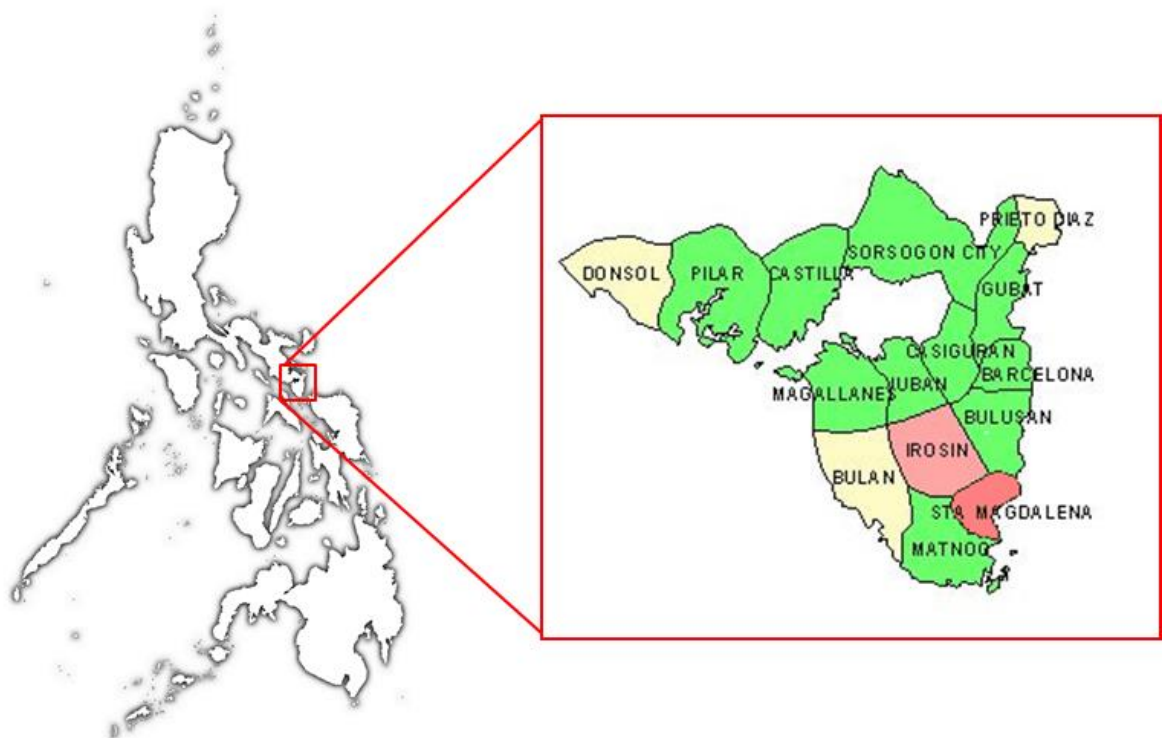
R1 - Rice Watch Action Network

SMS – Short message service

SRI - System of Rice Intensification

iv) The assessment area

(Sorsogon Province, municipalities involved in red)



Executive Summary

Rice Watch Action Network (R1) have been implementing a Climate Resiliency Field School (CrFS) approach since 2007, and has expanded it to 33 areas or local governments across The Philippines. This assessment reviewed impact for groups in Irosin and Santa Magdalena, at the southern tip of Luzon, through a formal survey of 150 respondents (about 30% of total group membership in the two areas) and 8 focus group discussions to enable triangulation and more in-depth investigation of mainly qualitative issues. Group members rely largely on agricultural livelihoods, with rice the predominant staple crop, supplemented by livestock (pigs and poultry), coconut, fruit and vegetables.

Each CrFS receives a season-long training programme with a focus on sustainable, agro-ecologically-based, on-farm training and experimentation and increased access to weather and climate forecasts across a range of timescales, from early warning of tropical cyclones to long-term climate change. The approach is implemented by staff from Local Government Unit Agricultural Offices, with training and mentoring support from R1. This ensures buy-in by Municipalities, facilitated by national legislation on organic agriculture and decentralised decision-making, who also commit to providing their support and resources, thereby strengthening sustainability. The strong relationships between R1, PAGASA and their LGU counterparts is an important part of making this partnership work.

Both the formal survey and the focus group discussions delivered mostly complimentary and corroborating information. Groups use a variety of forecasts, with two sources (TV and radio) being outside CrFS activities, but the 10 day, seasonal and long-term climate forecasts received almost exclusively due to the CrFS approach. Interestingly, focus groups highlighted how the training provided enabled a better understanding of the regular TV forecast and increased coverage of early warning for storms and tropical cyclones. Complimentary agricultural advisories received with forecasts were considered very useful or essential by over 90% of those involved to making resilience-building decisions.

Together the forecasts, advice and training received has generated substantial improvements in productivity, reduced costs and there is some indication of damage avoided, especially for crop production activities. Given the integrated nature of the package, respondents found it sometimes difficult to separate out the impact of forecast use alone but 52% estimated a productivity increase of 10% or more due to forecasts and a further 36% confirmed a positive but non-specific yield enhancement. Likewise, 34-43% confirmed reduced input, labour and marketing costs of 10% or more with 25-42% confirming a non-specific reduction due to forecast use. Broadly similar results were registered for livestock production. CrFSs have used the approach to expand their access to markets, particularly for rice varieties not available due to the expansion of less resilient hybrid monocultures, with the CrFS logo becoming a trademark of quality produce.

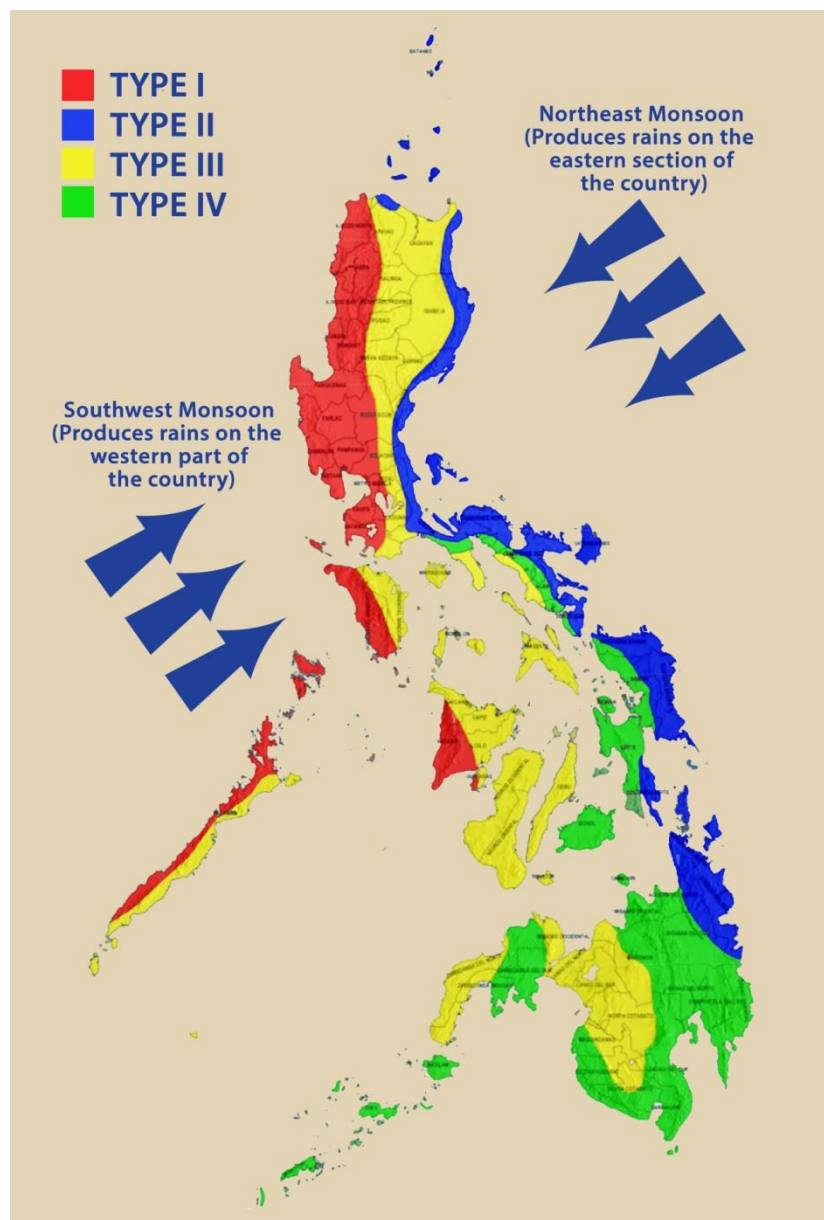
One interesting difference between the formal survey and the focus groups was the clearer descriptions of forecast-based decision-making from the latter. Results in the formal survey suggested lesser use of seasonal and long-term forecasts, whereas focus groups emphasised their importance and a wider range of decisions, including the motivation to switch to more resilient, agro-ecological methods to protect their lives and livelihoods. Overall use satisfaction was high, with 69% intending to expand their use of forecasts and a further 28% intending continued use at current levels. There is also high demand for additional forecast resources, with increased coverage of weatherboards for the 10 day forecast, more frequent forecast updates and expanding forecast use through SMS access the clear favourites. Given their vulnerability to climate change and variability and the multiple benefits that communities derive from the CrFS approach, scale-up to other areas is an important strategic priority.

1. Background

1.1 Climate background

The Philippines is an archipelago of 7,107 islands covering a total land area of 298,170 km², with a population of just over 102 million. Population growth has declined steadily since 1955 from 3.6 to 1.5% per annum. Some 9.671 million hectares, or about 32% of the land area, is used for agriculture which is divided 51%:44% between arable (mainly rice and maize) and perennial crops (such as coconut, banana, sugar cane and pineapple). The country's 4.8 million farms employ about 30% of the total workforce and provide 10% of GDP¹.

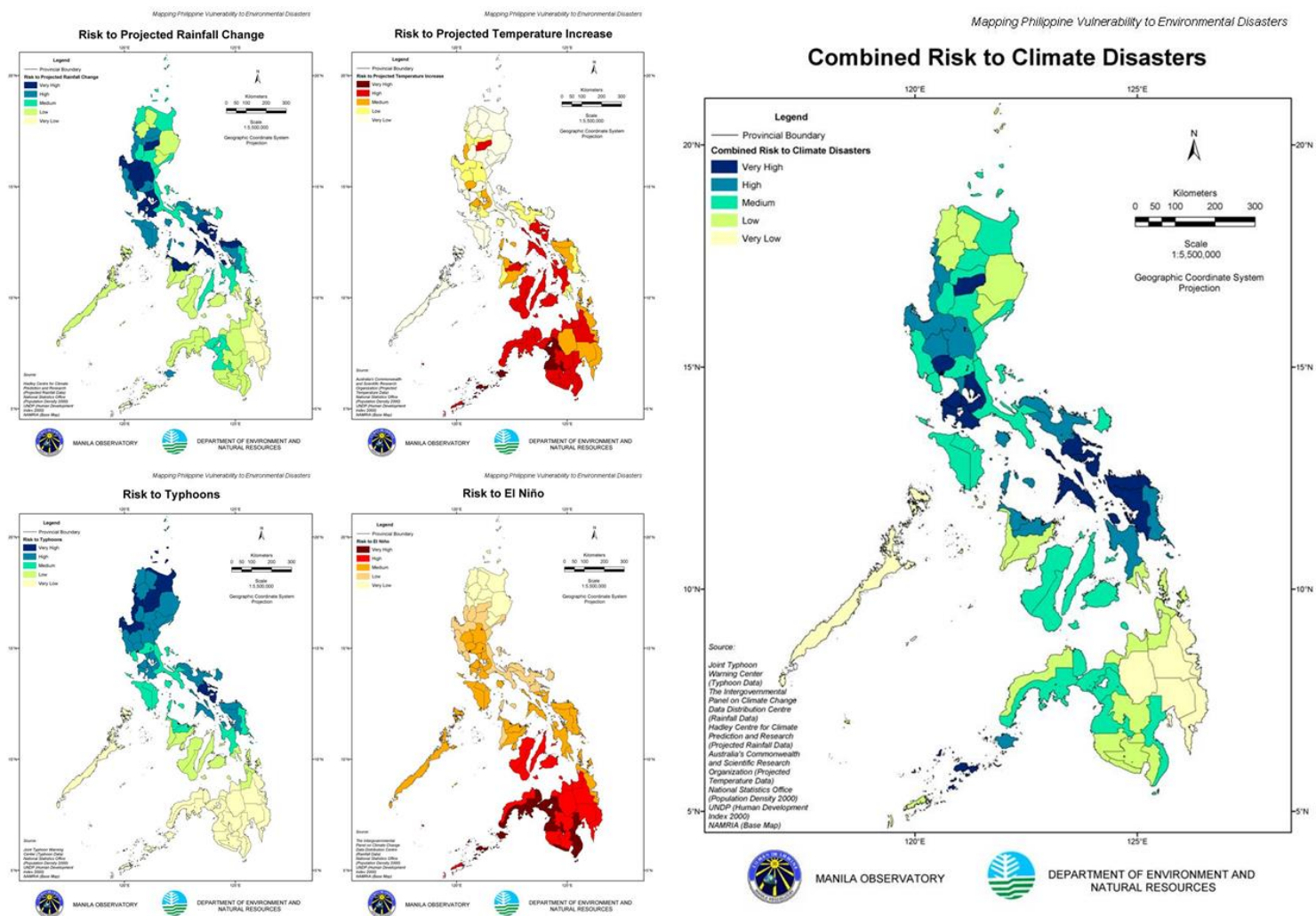
Fig 1. Climate zones



Climatically, The Philippines is divided into 4 zones (see Fig 1) – type 1 has two pronounced seasons with most rain falling from June – September; type 2 has no dry season but a pronounced wet season from December – February and minimum monthly rainfall from March – May; type 3 has no pronounced wet or dry seasons but with rainfall relatively lower (<100 mm per month) from February to April). Even wetter months tend to have lower rainfall than types 1 and 2; type 4 climates have no clear wet or dry seasons but relatively similar rainfall across all months, albeit like type 3, without the high rainfall levels found in types 1 and 2.

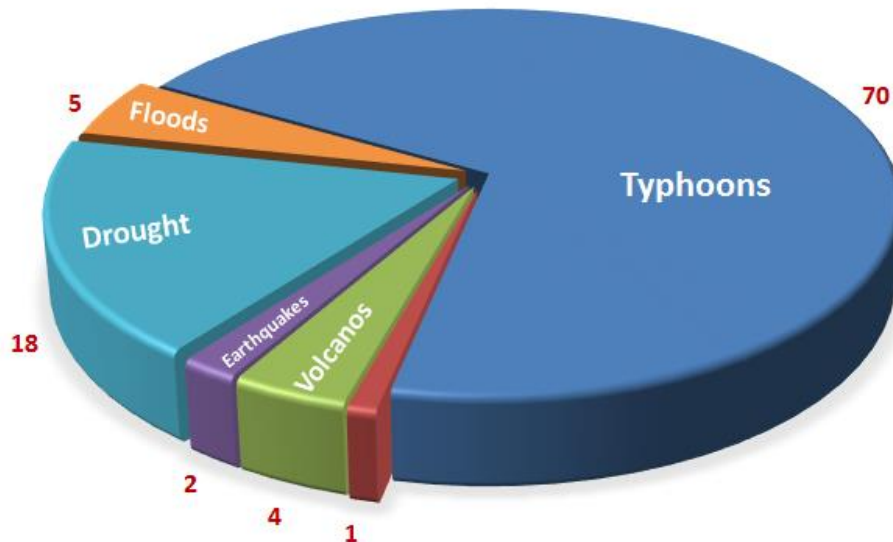
The Philippines in general, and the area covered by the impact assessment in particular, face a variety of increasing climate risks (see Fig 2 below). While the Bicol Region, has relatively low exposure to El Nino, it is in either high or very high risk categories for projected

Fig 2. Climate risk projections for The Philippines (Manila Observatory)²



rainfall change, temperature increase and tropical cyclone risk. This makes Sorsogon the 4th most vulnerable province for combined risk to climate disasters. Despite its key importance to the economy, agriculture is the most exposed to these risks and has suffered an average of P12.43 billion (about \$250 million) of damage per annum since 1990, 70% of this related to cyclones (see Fig 3 below).

Fig 3. Distribution of the costs of natural disasters to agriculture 1990 – 2006

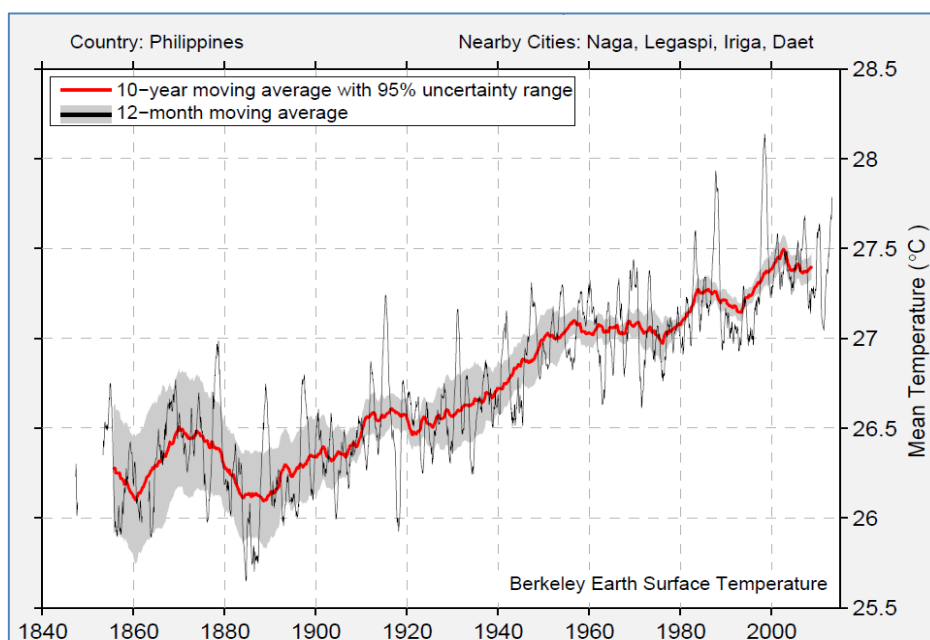


Source: National Climate Change Action Plan, 2011-2028

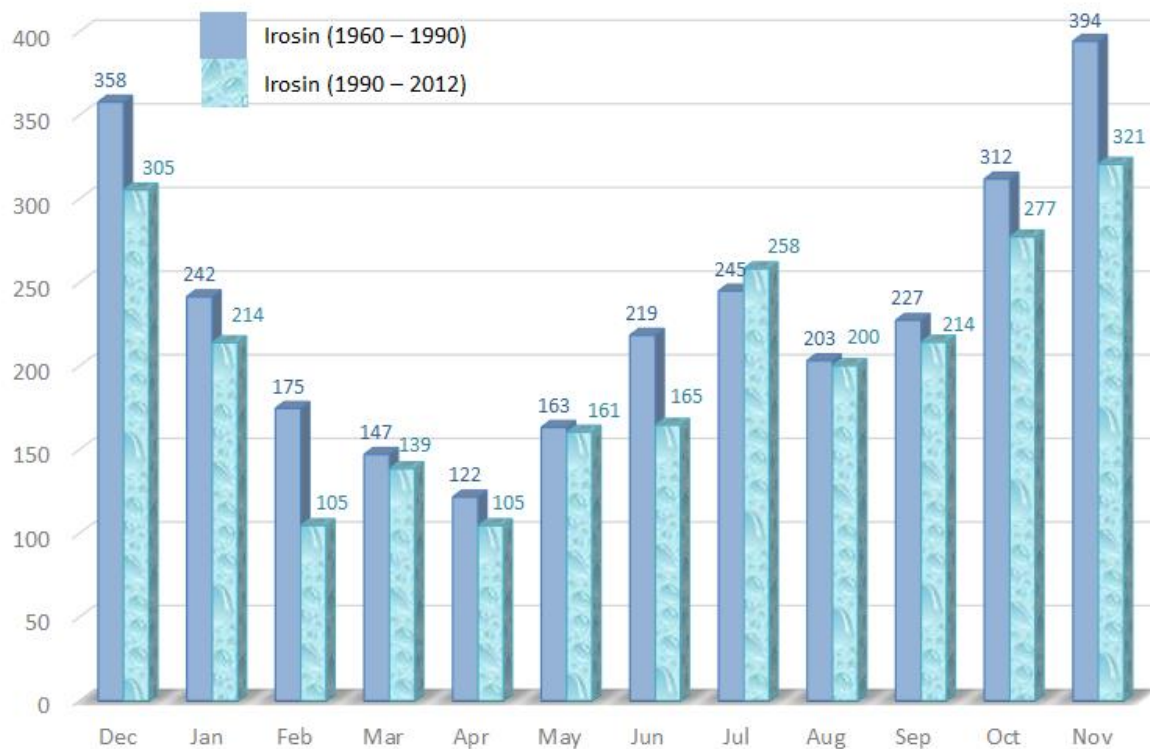
1.2 Sorsogon Province, Southern Luzon

Agriculture is relatively more important in rural southern Luzon. In the Bicol Region (which includes Sorsogon Province), it contributes 23.3% of GDP and employs 37.8% of the workforce. The division between arable and perennial crops is also different, with 64% of the agricultural area in the latter and only 27% in the former. Average rice yields nationally are around 4 MT/hectare (2012)³ with those in Sorsogon about the same.⁴

Fig 4. (a) Average temperature rise since 1860⁵



...and (b) average rainfall since 1960 (Jan – Dec)

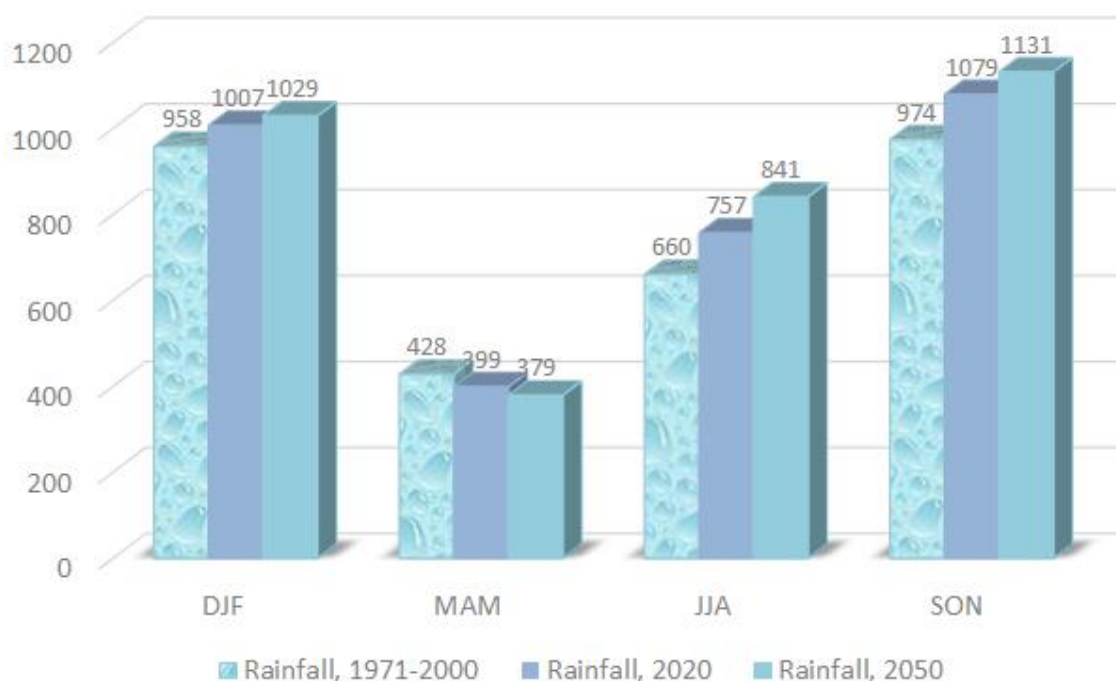


Source: Climate Change Knowledge Portal (World Bank)

The two municipalities covered by the survey – Irosin and Santa Magdalena – are both type 2 climates. In the period 1948 – 2006, 33 tropical cyclones crossed Sorsogon, 60% of these in the months of September – December, making the region one of the most typhoon-vulnerable in the country. Temperatures fluctuate slightly across the year, with minimum temperature varying from 22.7°C in January to 24.7°C in May – maximum temperatures from 28.7 to 32.3°C for the same months. Average temperature has increased by about 1.5°C over the past 150 years (see Fig 4(a) above) and is expected to rise a further 1.7–2.2°C by 2050. Despite a historical decline of 17% from 1960-90 to 1990-2012 (see Fig 4(b) above) for Irosin, average rainfall for Sorsogon Province as a whole is also expected to increase during the main northeast monsoon months (Oct – Feb) by 12% but decrease in the hotter, drier months of March to May by 11% (see Fig 5 below). These months will also see the highest temperature rises.

Potential risks to agriculture from this scenario include increased crop losses to pests and diseases, reduced livestock production related to disease and heat stress, and flood damage, especially as increased rainfall is combined with increased intensity – the number of raindays with greater than 300mm is expected to increase from 1 to 11 per annum by 2050. On the other hand, if adaptation is effective, increased rainfall could also reduce moisture stress and increase productivity, especially for crops such as upland rice that are rain-fed and have fewer options in mitigating moisture deficits through irrigation.

Fig 5. Project rainfall change in Sorsogon to 2050⁶



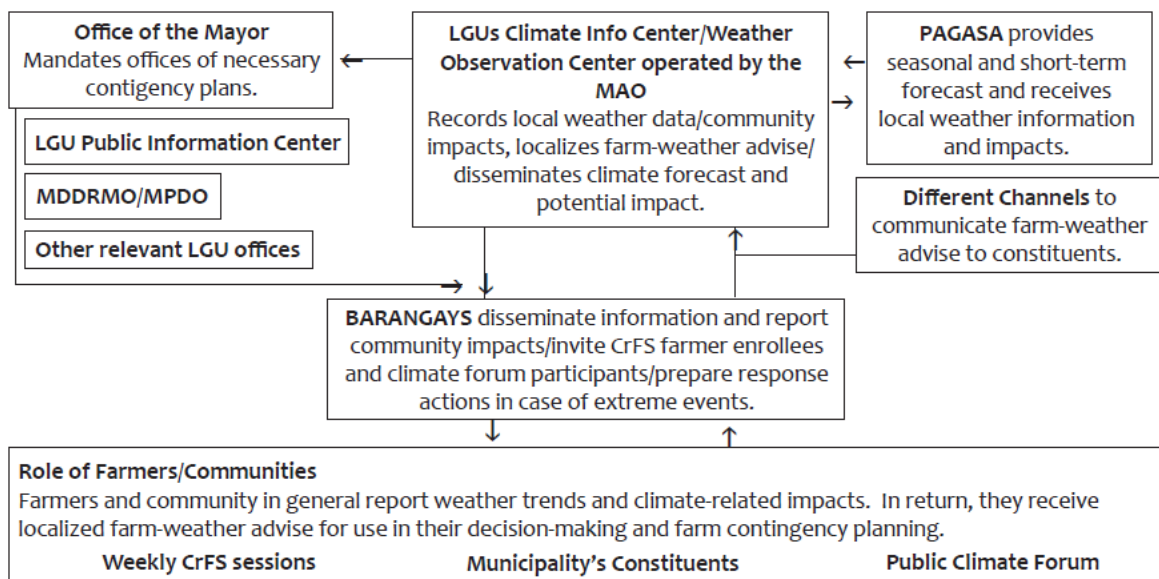
1.3 Climate-resiliency Field Schools (CrFSs)

The CrFS concept was first designed in 2002 based on the Farmer Field School approach then being most widely applied to Integrated Pest Management. The first CrFSs were established in 2007 and the approach has since expanded to 33 areas or local governments across the country. In Sorsogon Province, 4 of the 15 LGUs now have CrFSs, 2 of which were involved in this survey. The approach is more than just a vehicle to provide weather forecasts and climate information to farmers – it seeks to support the transition from low sustainability, high external input dependence, ‘conventional’ agriculture to high sustainability, resilient agro-ecological methods that include enhanced anticipation of climate shocks and stresses. Implementation is premised on a close civil society-public partnership between R1, PAGASA and the Local Government Unit (LGU), especially the Municipal Agriculture Office which installs the automatic weather station as part of the process of establishing a Climate Information Centre (see Fig 6 below).

With respect to increased access to and use of climate information, the four main objectives of the CrFS approach are to:

- Enhance farmers’ knowledge on climate variability and ability to anticipate extreme climate events and modify farming decisions;
- Assist farmers in interpreting climate information from PAGASA and facilitate adoption of contingency crop plans;
- Assist farmers in observing climate parameters to support farming practices (e.g. land preparation, pest management);
- Provide the forecast information generation community with farmers’ experiences to assess the relevance and the need to re-design/refine climate information

Fig 6. CrFS operations, showing the main stakeholders involved⁷



A traditional weather station



Anticipated benefits for each of the main stakeholder groups include:

- Farmers – are better able to anticipate potential climate risks; increase income with climate-friendly technologies; increase confidence through participation and constant interaction with LGU agricultural extension; increase their knowledge on farming; and increase knowledge of other risk reduction strategies.
- LGUs - establish access to climate information necessary in programming and planning services (not just agriculture); foster better relations with their farming constituency through constant and regular interaction to raise awareness on weather forecasts and suggested risk

management advice; promote community preparedness, avoiding huge potential losses for the community and savings for LGUs from potential rehabilitation costs and disruption or loss of livelihoods.

- Climate-resiliency Field School as an Early Warning System - determine risks, specifically climate related risks, to local agriculture's success; detecting and predicting these weather related hazards through the EWS service by PAGASA and the LGU; formulation of warning and corresponding farming advisory by the LGU.
- Municipal Agriculture office - dissemination of warning/advisory; community or farmers' response.

A key part of this has been diversification, in terms of both access to staple crop varieties and into other agricultural enterprise options, such as vegetable cultivation. Increasing the resilience of rice production has focused on improved varietal selection of local rice varieties, System of Rice Intensification (SRI) and the increased use of organic fertilisers. For example, CrFSs in Irosin now have 29 improved local varieties of rice developed through on-farm multiplication and seed banking for use through the SRI approach, from an initial five varieties. In 2011 when the project started, the municipality was dominated by just two hybrids.

Hot work – manually harvesting rice



2. Assessment Findings

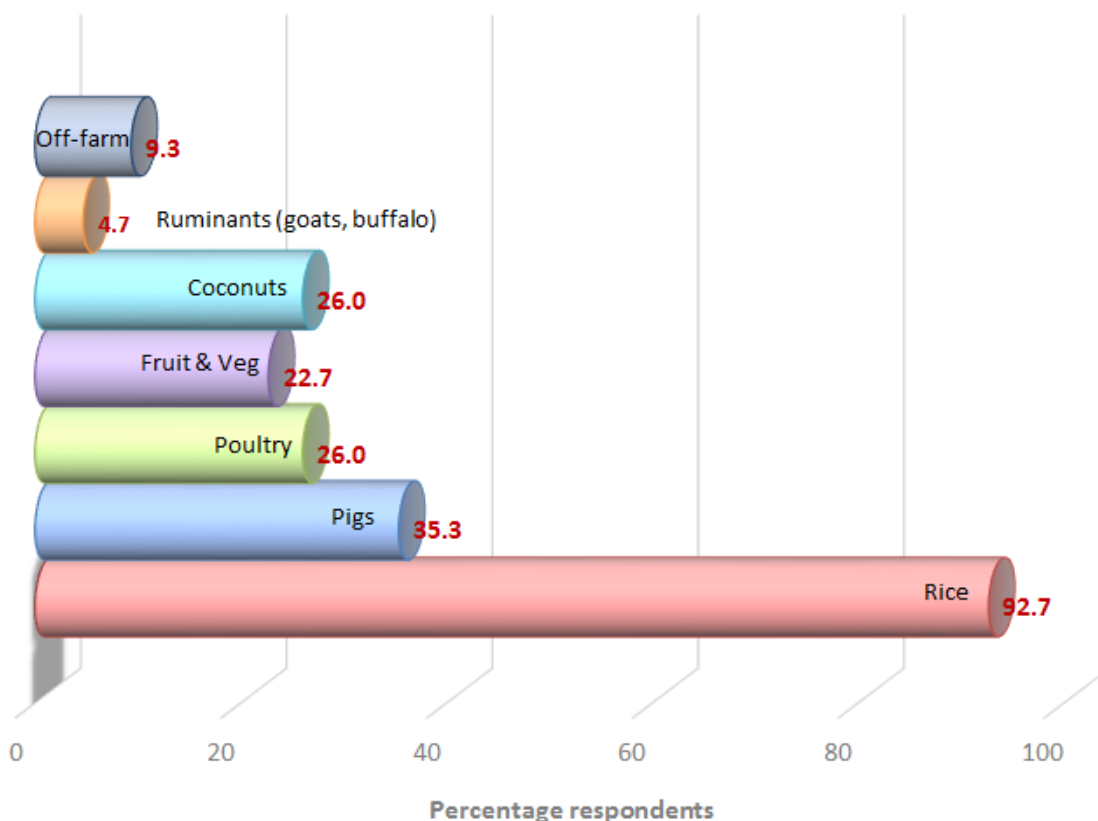
2.1 Methodology

This impact assessment of climate services was carried out from 29th March – 15th April 2016, focusing on the Climate Resiliency Field Schools (CrFSs) supported by the Rice Watch Action Network (R1) in the municipalities of Irosin and Santa Magdalena. A dual approach methodology was used which entailed a formal sample survey of 150 farmers together with a simultaneously implemented set of 8 focus group discussions. The sample represents about 30% of the total membership in CrFSs across the two municipalities. The former concentrated on close-ended questions for quantitative analysis while the latter enabled a more in-depth discussion that covered both quantitative and qualitative issues. Both approaches followed a closely-related format to enable triangulation of information, thereby increasing the reliability of detection of key impacts or their absence. The formal survey sample was selected to give a representative cross section across the two municipalities – one (Irosin) that included climate service users that have been operating CrFSs since 2010 and one (Santa Magdalena) more recently initiated that have only a year of operation. The sample was split 75/25 across these two municipalities, covering a total of 30 barangays (or villages) and an average of 5 randomly-selected respondents per barangay. This ensured that more-or-less all CRFSs had members involved in the survey. It was also important to have a balanced gender distribution across the sample – in the event, 55% of respondents were men, 44% women and 3% husbands and wives together. For survey implementation, the sample was split into 6 groups, with each enumerator carrying out 25 interviews at a rate of about 5 per day.

2.2 Forecast user characteristics and perceptions

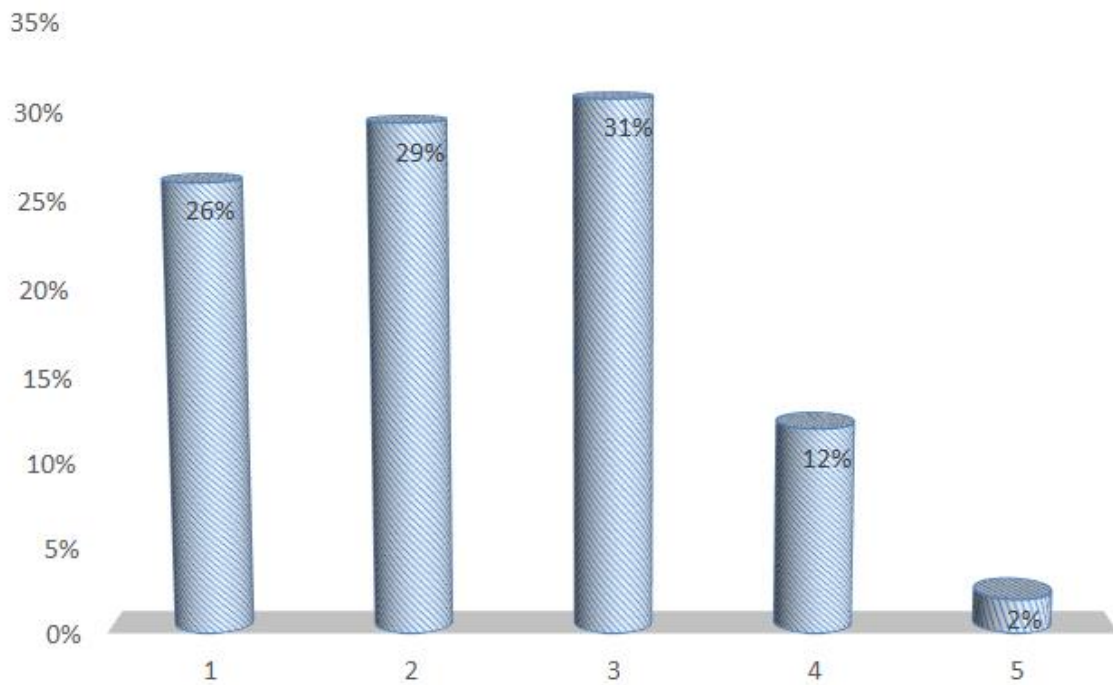
The main occupation for CrFS members is overwhelmingly rice cultivation (see Fig 7 below) together with up to four other mainly agricultural livelihood options.

Fig 7. Livelihood options



Only 9% have an off-farm enterprise included in their selection, mainly fishing, retailing and manual labour, whereas 55% raised some form of livestock, with pigs the most popular option. About 26% rely on only one enterprise for their livelihood, with 90% of these focused on rice production. Most households have 2 or 3 main livelihood options and a small number 4 or 5 (see Fig 8 below).

Fig 8. Number of livelihood options per household

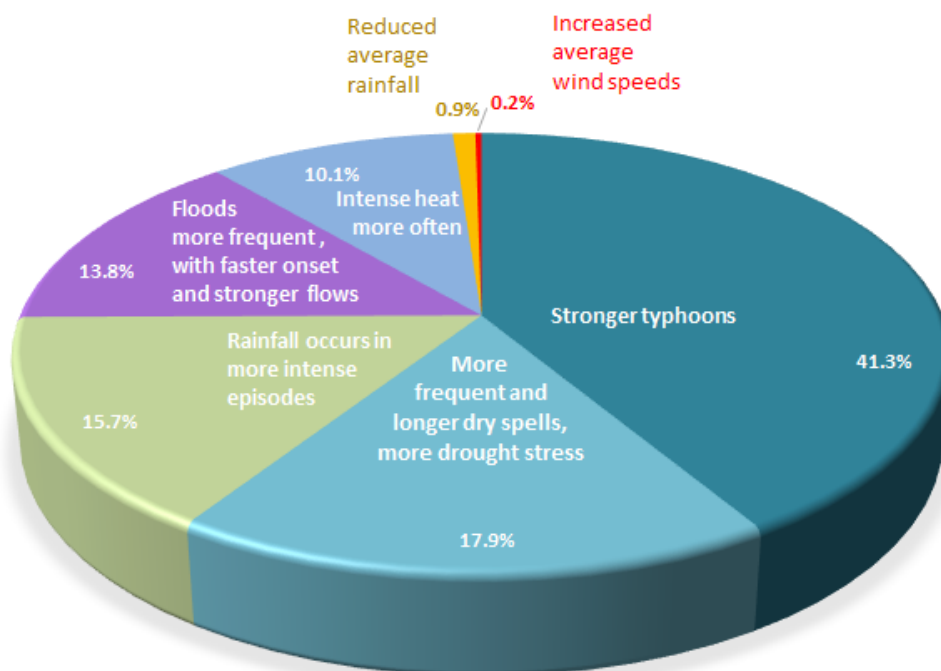


A bottle gourd and proud owner –diversifying into vegetable production can increase resilience



Only 7% have had some previous experience of a resilience-type intervention, typically through their irrigation or farmer association and usually focused on a single issue, such as disaster risk reduction or the impacts of climate change on children. Only 1% reported having any prior experience specifically related to training on climate services. However, perceptions of climate change from personal experience are varied (see Fig 9 below). The most significant of the changes perceived over the past 10 years has been the increased strength of tropical cyclones. Four others – more frequent heatwaves, more intense rainfall, stronger and more frequent floods and longer and more frequent dry spells – all suggest an experience of an intensification of the hydrological cycle that is broadly consistent with greenhouse gas forcing as anticipated in climate change scenarios. Average changes, such as rainfall and winds outside tropical cyclones, were seen as less significant. Focus group discussions revealed the same concerns with increased temperature, especially in the February – April period, and increasingly intense rainfall given slightly more prominence than stronger tropical cyclones. There was also reference to rainfall levels increasing during the north-eastern monsoon months but decreasing at other times of the year, which is consistent with climate projections (above in Fig 5) although not so much with the historical rainfall record. Group members also referred to the need to carry out farm operations earlier in the day and stop by 9.00 am instead of midday due to increased heat, and the links between land degradation, deforestation and climate vulnerability.

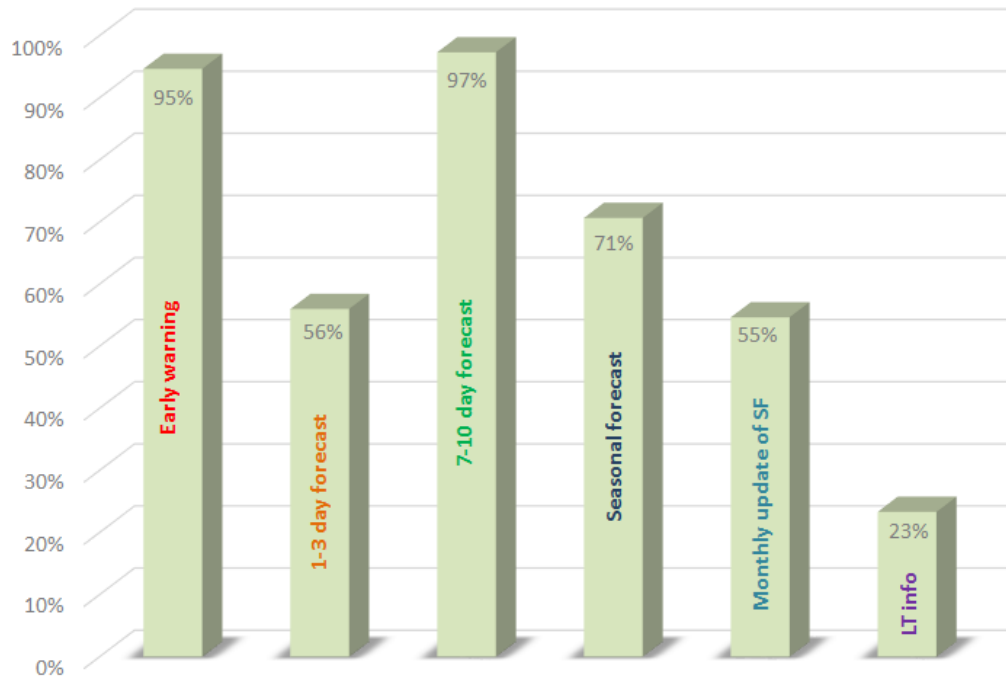
Fig 9. Perceptions of climate change over the past 10 years (combined preference scoring)



2.3 User experience of forecasts

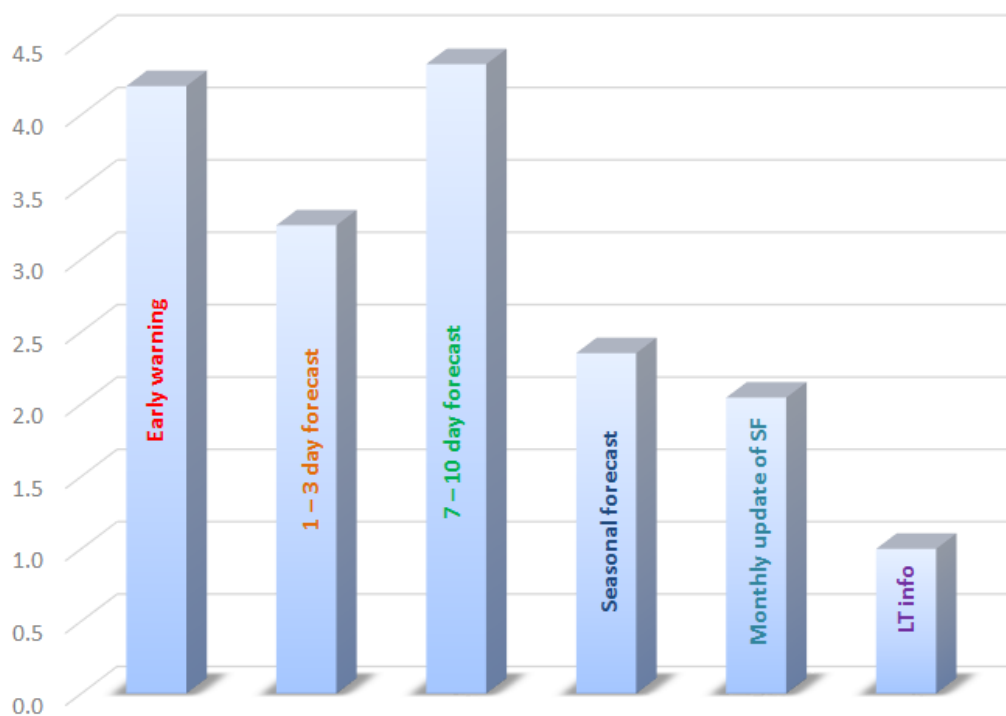
CrFS members are receiving a variety of forecast products, from early warning to long-term climate information and scenarios, through a variety of communication methods (see Fig 10 below). The two most widespread, with almost universal 95%+ coverage are early warning and the 7-10 day forecast.

Fig 10. Coverage of different types of forecast



The seasonal forecast also succeeded in reaching over 70% of members but short-term forecasts and seasonal updates drop towards 50% coverage. Only about a quarter have received information about the long-term climate scenarios for the area.

Fig 11. Usefulness score/5 for various forecast products

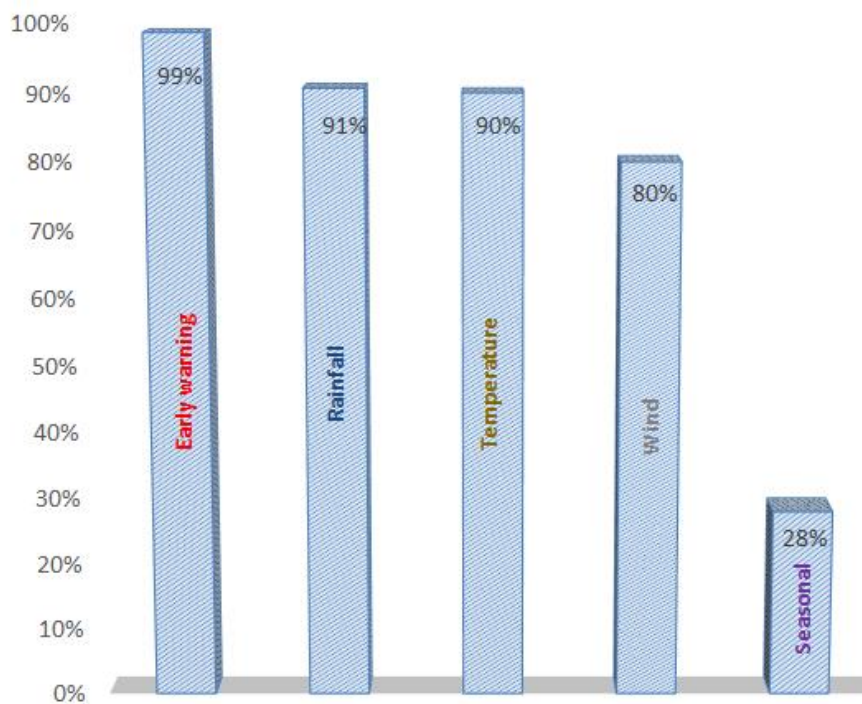


Solar crop drying facilities are widespread in the area – sometimes they are also used for driving on



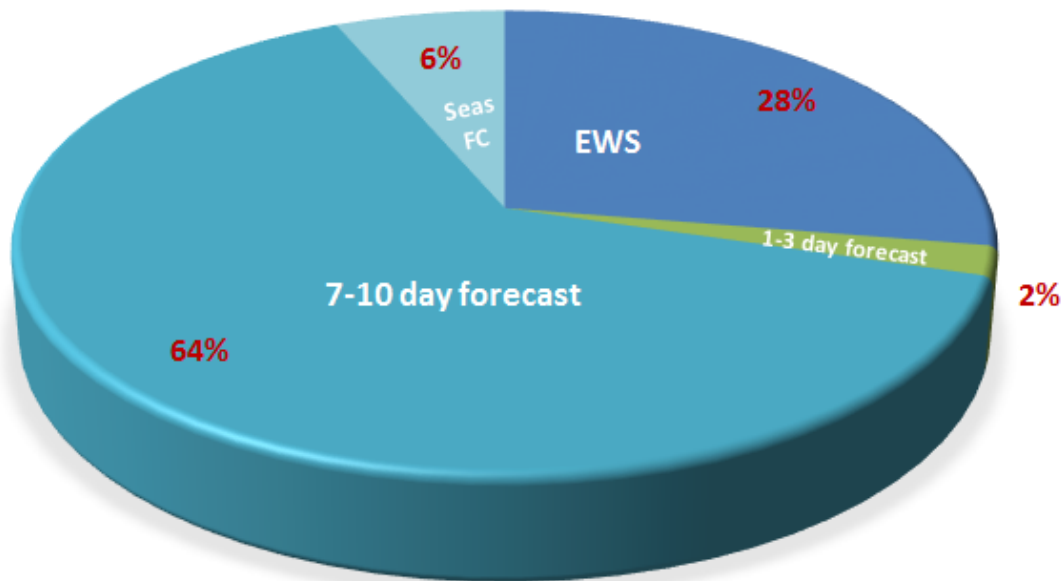
Roughly similar results to coverage were shown in terms of usefulness (out of 5, see Fig 11 above), with the early warning and 7-10 day forecast seen as significantly the most useful, but with the short-term 1-3 day forecast outscoring the seasonal and long-term forecasts despite the former's wider coverage.

Fig 12. Type of meteorological information received in forecasts



The responses for coverage and usefulness were both consistent with those reflecting the meteorological information that forecast users have received, with early warning, rainfall and temperature information all registering over 90% responses (see Fig 12 above). These are the main components of the early warning and short-term forecasts, whereas seasonal information dropped to a lower level than coverage, suggesting some difficulty in understanding and using this resource. When asked from which forecast this meteorological information comes from, nearly two-thirds of early warning, rainfall, temperature, wind and seasonal information is received through the 7-10 day forecast posted on the weatherboard (see Fig 13 below).

Fig 13. Sources of EW, rainfall, temperature, wind and seasonal information

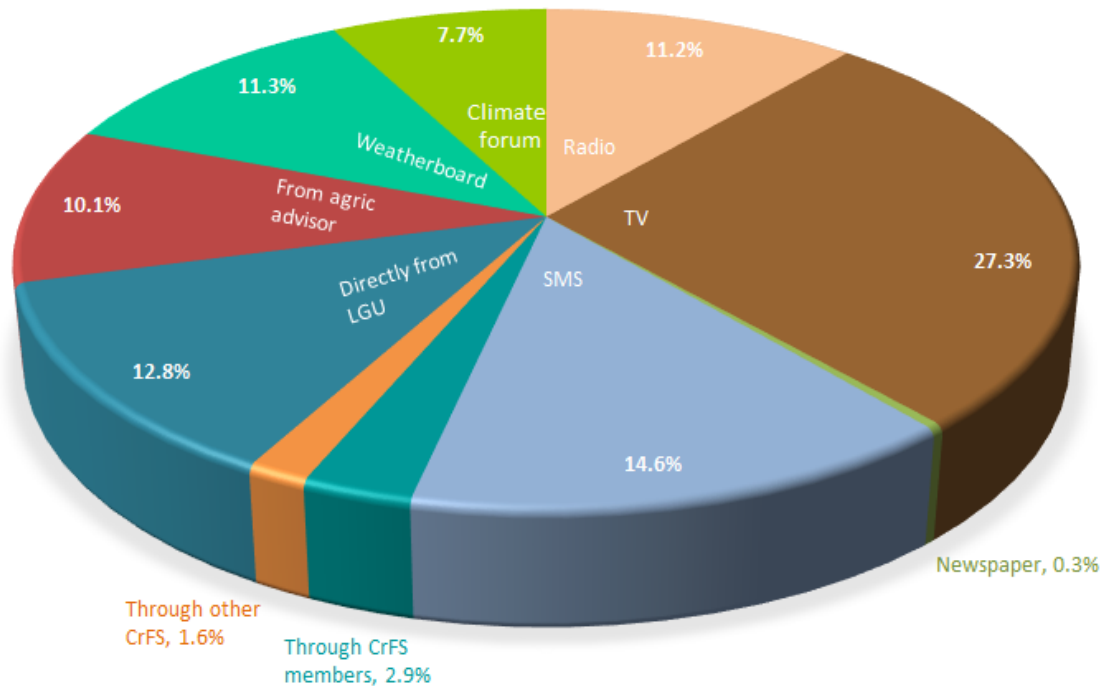


Communication preferences were varied and reflected continuing use of traditional methods such as radio and TV (not used by the project) as well as the increasing popularity of direct interaction, with climate forums, and directly from the LGU or an agricultural advisor covering about a third of preferences (see Fig 14 below). Weather boards and particularly SMS messages account for a further quarter of preferred ways of access, so that CrFS members now cite these group-directed communication methods for nearly two-thirds of their preferred ways of receiving forecast information. About 94% report receiving at least one type of forecast through their CrFS and 68% of the communication channels used to access forecasts now run through the CrFS to members. In practice, this means that forecast users receive forecasts through an average of four different communication channels, three of which are routed through the CrFS – so membership of a CrFS has expanded access to forecasts fourfold. In addition, 45% reported receiving early warning messages not through the usual TV source but from the weatherboards established primarily to communicate 7-10 day forecasts, suggesting that this has become the main source for quality weather information (as Fig 13 above suggests). It could also account for the near complete coverage of early warning systems.

Focus group discussions produced a similar range of communication methods but with the weatherboard and SMS given particular prominence as preferred channels. Likewise increased prominence was given to seasonal and long-term climate change forecasts, which were received by 5 of 6 groups. Members highlighted the importance of the climate forum to other forecasts, with explanation of meteorological terminology and uncertainty assisting understanding of the 10 day weatherboard forecast and forecasts not routed through the CrFS, such as the TV forecast. They indicated that the seasonal forecasting process also ensured that they received early warning of the

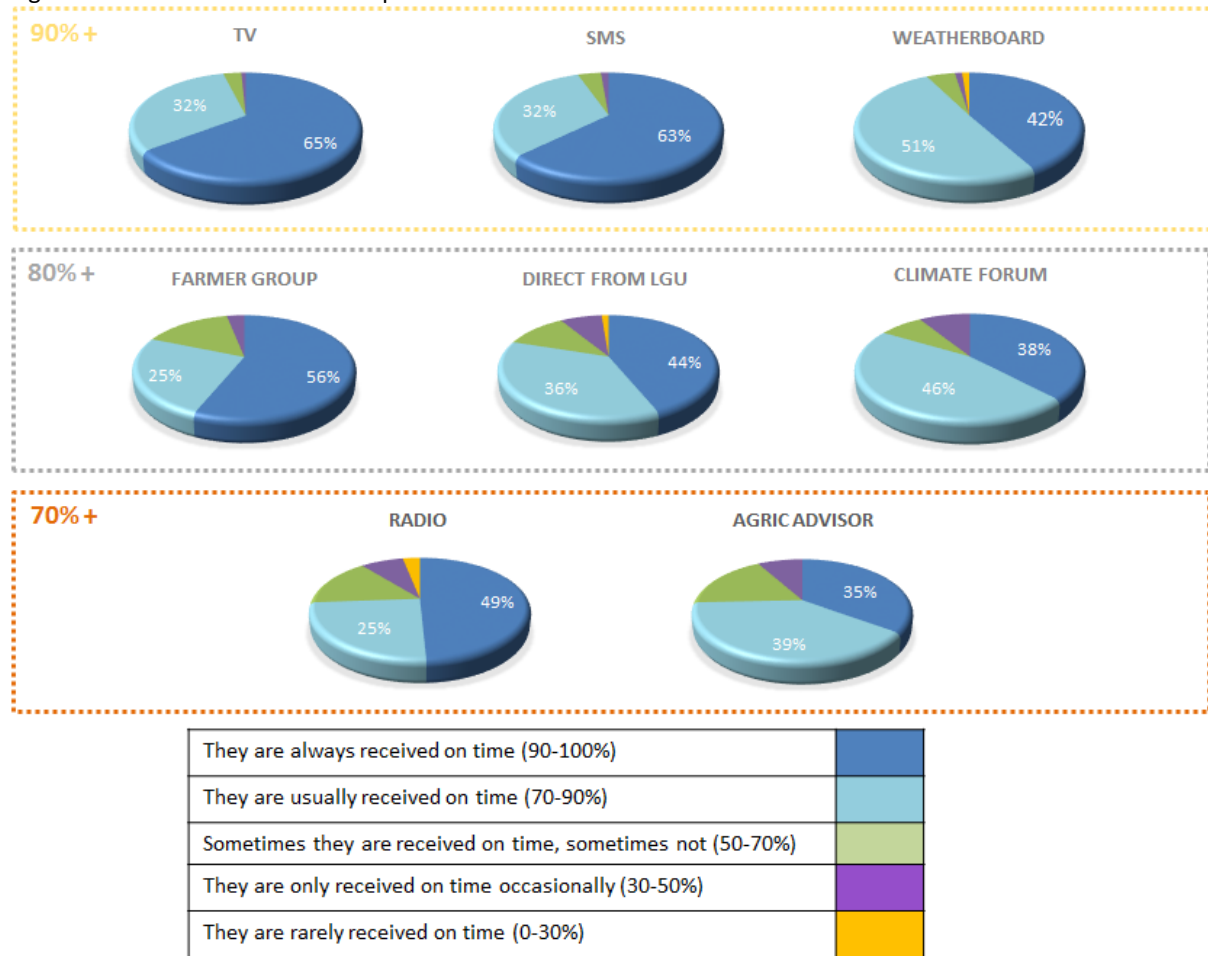
El Nino in October 2015, which facilitated decisions around drought resilience and irrigation management. Long-term climate change has been a regular subject integrated into the CrFS programme (which may explain the low level of response to it as a more-specific forecast question in the formal survey), including the implications more relevant to Sorsogon.

Fig 14. Communication preferences (combined preference scoring)



Preferences also reflect timeliness of forecast receipt. TV, SMS and weatherboards all occupy the top positions in this respect, with over 90% always or usually received on time (see Fig 15 below). The more interactive methods of climate forum and direct from the LGU occupy the next tier, together with communication through other group members at 80%+. Radio and from an agricultural extensionist are both in the lower, but still timely 70%+ category. Overall, 71% of CrFS members receive at least one forecast always on time and 98% get at least one forecast always or usually on time. Considering preferences and timeliness together suggests that the most favoured communication methods vary quite considerably across the user groups and by using a variety of methods, they are receiving forecasts in a regular and timely way. Focus groups unanimously agreed that they were regular and on time, with only phone signal issues delaying the SMS by up to 24 hours.

Fig 15. Timeliness of forecast receipt

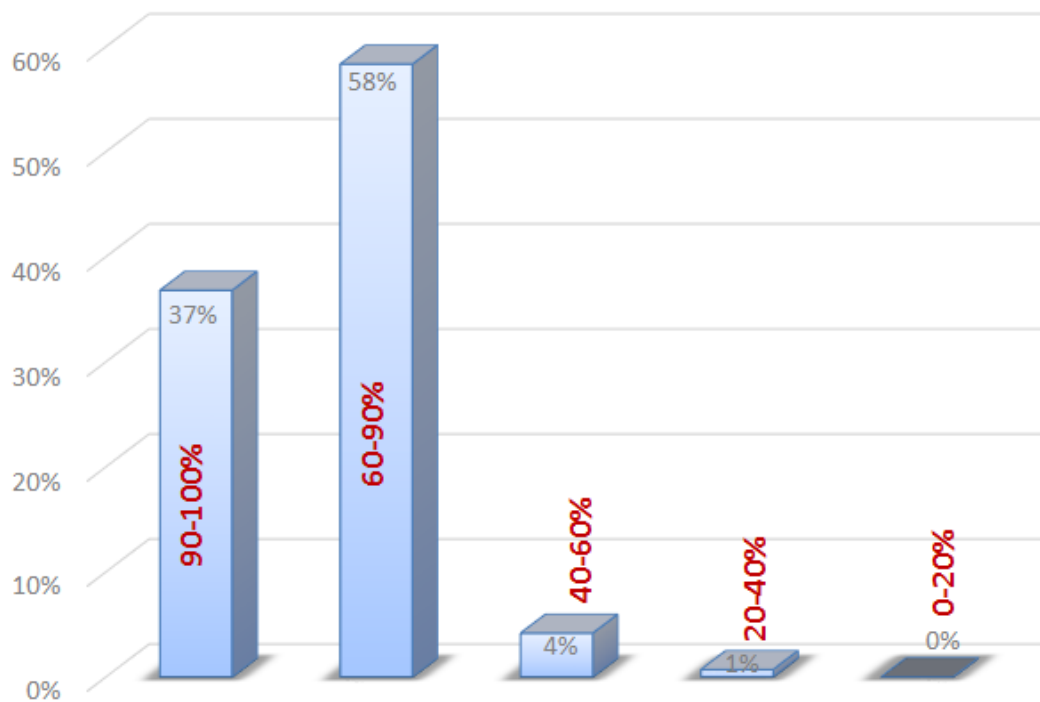


Organic strawberries – a tasty recent introduction for on-farm diversification



CrFS members assessed the reliability (skill) of the 7-10 day forecast in terms of how often weather conditions occur as anticipated, with 95% confirming that it either mostly or almost always gets it right (see Fig 16 below). Focus groups split roughly equally between 70-80% reliability and 80-90% reliability. Focus groups also confirmed that they understood forecasts have an inherent level of uncertainty and this does not prevent them making decisions about their livelihoods, but increased uncertainty can affect their decisiveness in making decisions. One way of overcoming this was to use traditional knowledge (see 2.6 below) to confirm the forecast.

Fig 16. Reliability of the 7-10 day forecast



The number either providing feedback on the forecast or further explanation of forecast language and detail was relatively low at only 12% - many of these said that their feedback was mainly to thank the LGU for the forecast, with only a handful raising concerns about timeliness and clarity of information or having the opportunity to feedback regularly. Those who did on a substantive issue received a subsequent follow-up to address their concerns.

2.4 Advice and decision-making

Forecast users identified a variety of types of agricultural advice that they have received with the forecasting system, with crop and crop variety choice, timing of planting and crop pest and disease control the most widespread. Over half also cite soil and water management, plant spacing and livestock health as key areas of guidance. With only 55% of the sample keeping livestock, the coverage of both livestock disease control and feeding would appear quite comprehensive.

Fig 17. Agricultural advice received with forecasts

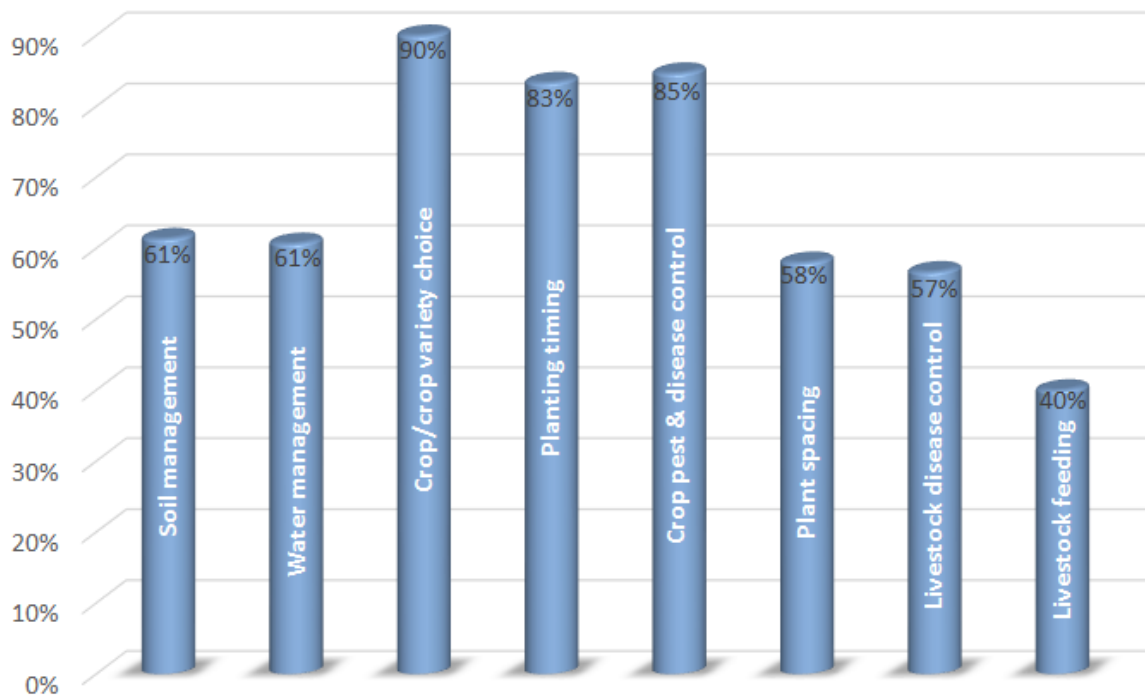
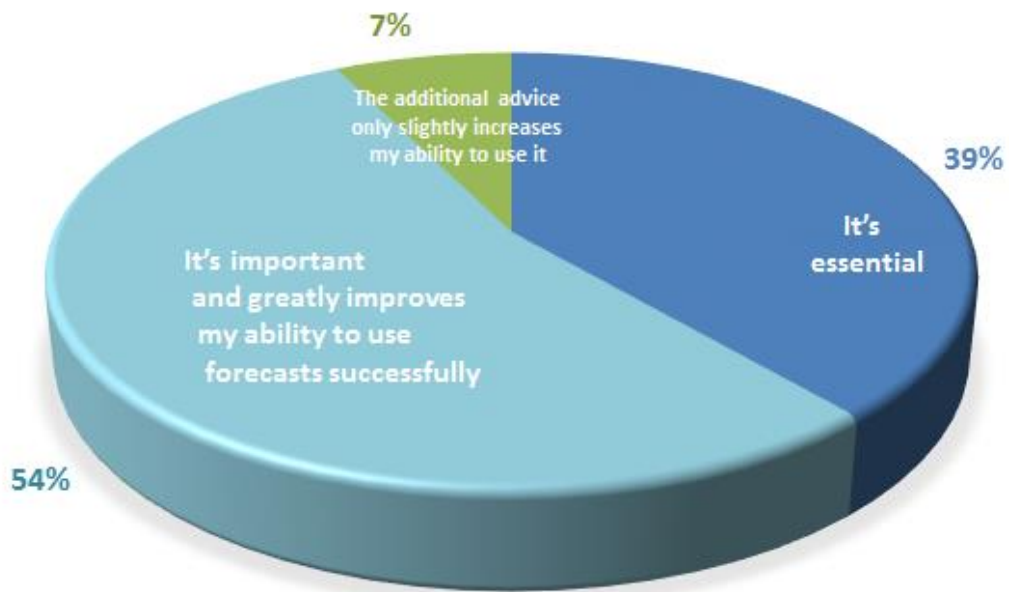


Fig 18. Importance of additional agro-ecological advice to successful use of forecasts



Responses for guidance on non-agricultural issues were less clear but 73% confirmed they had received advice on household food security issues and 67% on protecting household assets from risks including cyclones. Resilience-building advice is clearly viewed as a key part of effective forecast use, with 93% of users confirming that it is either essential or greatly improves forecast application. However, focus groups stressed that this advice needs to be designed to support climate resilient agriculture and not just conventional methods, such as using hybrid rice varieties, applying expensive chemical fertiliser and using chemical sprays for pest control.

Obtaining clear responses on decision-making through the formal survey proved more problematic - with the open-ended nature of the question, enumerators suggested or noted that much more time would have been needed with each interview for respondents to provide a comprehensive response. The main issues raised (see Fig 20 below) and the level of response was lower (excepting using early warning to prepare and evacuate) than would be expected from Fig 18, but still provide useful feedback that correlates to the focus group responses, particularly with respect to timing of input use, water and livestock management. An additional insight is the importance of using the seasonal forecast to guide both diversification and the transition to more resilient agro-ecological methods. This and the forecast-based decision-making detailed in Fig 19 from focus groups suggest that seasonal forecasts are more useful and important an information resource than the responses in Figs 11 and 12 imply. Overall, 99% of forecast users report using associated advice with forecasts to make decisions and 85% highlight the use of agricultural advice.

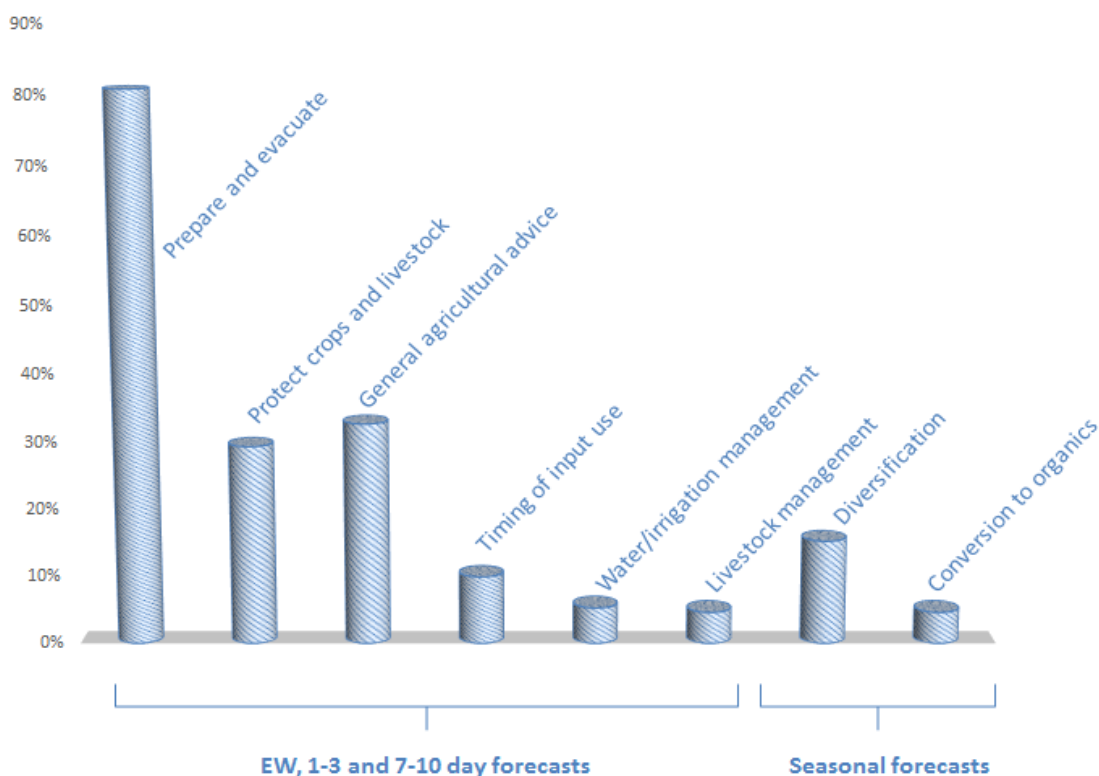
Pigs – the most popular local livestock option



Fig 19. Main decision-making based on forecasts (focus group discussions)

Main benefits/decisions made based on the 7-10 day forecast	Main benefits/decisions made based on the seasonal forecast
<ul style="list-style-type: none"> • Increased confidence and decisiveness about decision-making • Adjusting crop sowing dates • Adjust vegetable planting time and variety selection • Managing irrigation and crop mulching to conserve soil moisture • Adjust biopesticide spraying for pest control (to phase out chemical inputs) • Improved anticipation/preventative pest control, essential to organic agriculture • Adjusting biofertiliser/manure application based on intensity of rainfall • Timing biofertiliser/manure application to reduce wastage • Adjusting rice harvest timing to maximise chances of dry conditions/facilitate crop drying • Timing post-harvest crop drying effectively and transport to processing facilities • Timing housing of livestock, management of heat stress and hydration to avoid ill health 	<ul style="list-style-type: none"> • Adjust the cropping calendar and planting dates, avoiding periods with increased likelihood of longer dry spells • Planning ahead to ensure the right organic pesticides are available • Selecting the right crops/crop varieties, esp. important for rainfed crops e.g. plant maize, cassava and/or sweet potato rather than rice if drought is forecast • Choose planting timing and early maturing, drought resistant varieties in El Nino/drought years • Plan water conservation and storage as appropriate, esp. important on rainfed areas • Irrigation management to avoid crop stress in dry spells, especially in El Nino years • Focus on drought-resilient vegetables (sponge gourd, squash, okra)

Fig 20. Main decision-making based on forecasts



2.5 Impact of forecast use

The impact of forecast use was assessed from the user perspective on productivity improvements, cost reductions and damage avoided. In focus group discussions, CrFS members stressed that productivity benefits were from farm diversification as a whole rather than e.g. comparing rice yields before with those after joining the group, although for three-quarters of the groups, yields of rice were assessed as having improved by 10-25% from combination of increased use of forecasts and more sustainable agricultural practices. Groups also described food security benefits, such as expenditure on food dropping to 80 pesos for every 100 pesos they used to spend and increased health benefits from a greater variety of home-produced food free from chemicals.

A significant factor has been the difficulty in attributing improvements in productivity and input cost to forecasts alone given the package of support that is provided to the CrFS over the season-long training that they receive, which covers a range of activities from selecting and testing improved local rice varieties to system of rice intensification to soil management to forecasts. In this respect, in the formal survey, interviewees were given the option of providing a general productivity or cost response as well as a set of options on more specific improvements related to forecasts (see Figs 21 and 22 below). About 30-40% of farmers were reluctant to attribute specifically, but overall 96% confirmed a positive impact on crop yield and 98% on livestock production from forecast use. 52% of farmers felt that the impact was 10% or more; 42% felt the same with respect to livestock.

Interestingly a small group of about 5% of both crop and livestock farmers felt that input costs had increased but negative changes in other categories were all much smaller. On-farm trial results (see Annex 1 for on-farm trial results of locally-improved rice varieties, with resilience characteristics and yields) suggest that using improved local rice varieties selected for resilience could deliver yields at least twice the national/local average of 4 MT/ha. Farmer estimates suggest that their in-field results may be less than this but still significantly higher, giving an overall picture of improved productivity to which should be added lower production costs and some damage avoided.

Focus group responses for both costs and damage changed broadly confirmed the formal survey results, with changes in costs attributed partly to changing agricultural practice – so reduced seed and fertiliser costs of 55% and 50% respectively for rice – but also to forecasts, including reduced wastage of inputs of 80-100% through better timing of fertiliser/compost application, better irrigation management reducing costs by 20-50% and reduced pest control costs due to forecast-based anticipation and observation. One group highlighted how this means a lower requirement for loans and therefore less debt. With respect to damage avoided, in group discussions, members pointed out that damage was very specific to location and so it was hard to give a group response – *“some people have first class locations, others are in more vulnerable places”*. Likewise a paradox is that flood vulnerable areas have much better drought resilience. The main actions are in response to early warning, such as increased paddy bunds to reduce crop damage from floods, and protecting crops from cyclone/storm damage, through e.g. delaying rice harvesting or reducing leaves on coconut trees.

In the formal survey, estimating damage reduced through forecast use was the most difficult category of impact to measure and while some estimated considerable damage avoided for crops, livestock, home and health, the largest categories were either those who could not estimate this benefit or who felt that there was a positive impact but they could not quantify it. The main exception to this was for crop production, where 88% of respondents confirmed a positive result (similar to the focus group responses). On the other hand, 73% could not say whether they had avoided health costs as a result of forecast use. Livestock and avoided damage to the home were in between these two results (see Fig 23 below).

Fig 21. Changes in crop productivity and input cost as a result of forecast-based decisions (user estimated)

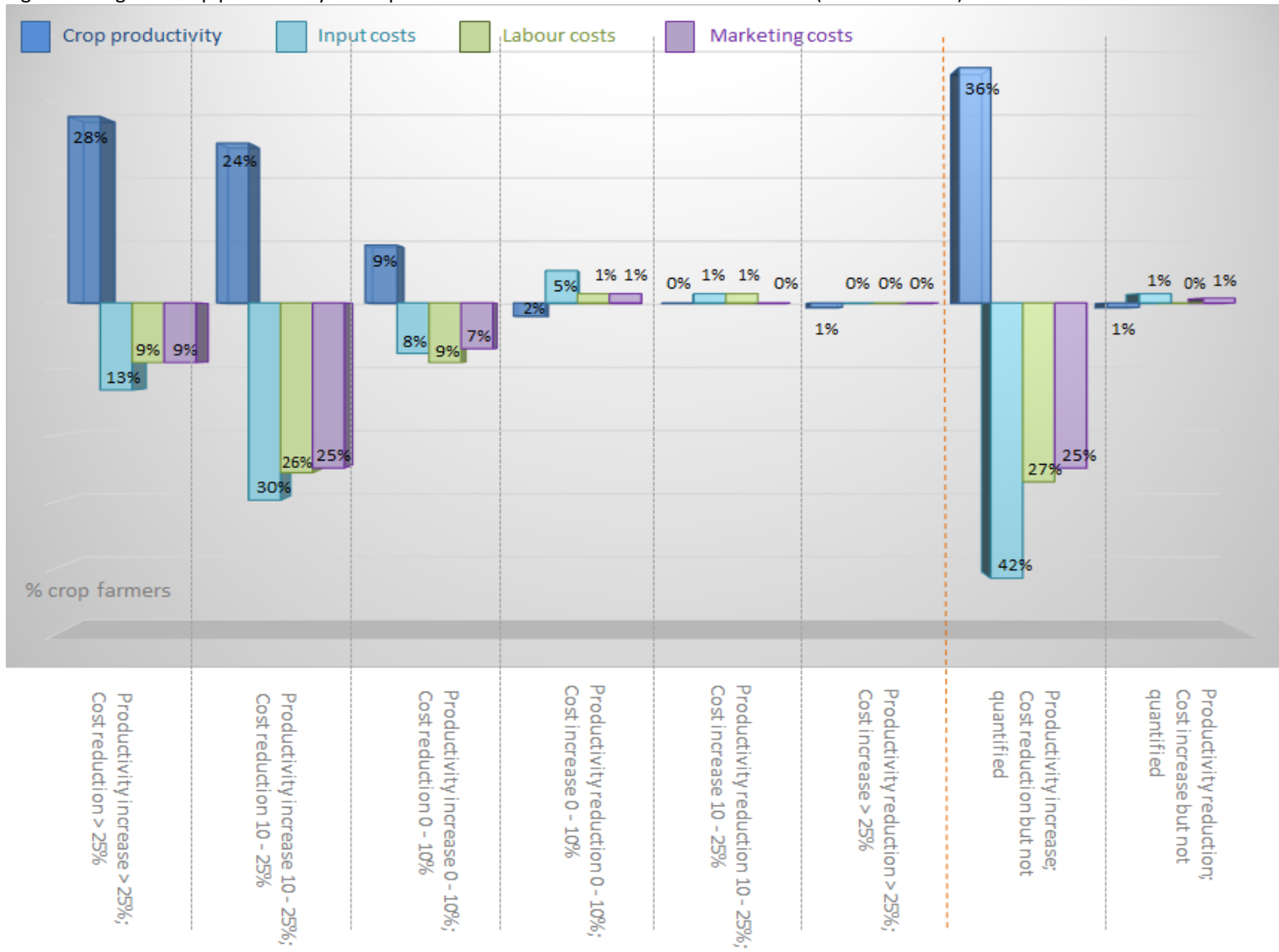


Fig 22. Changes in livestock productivity and input use as a result of forecast-based decisions (user estimated)

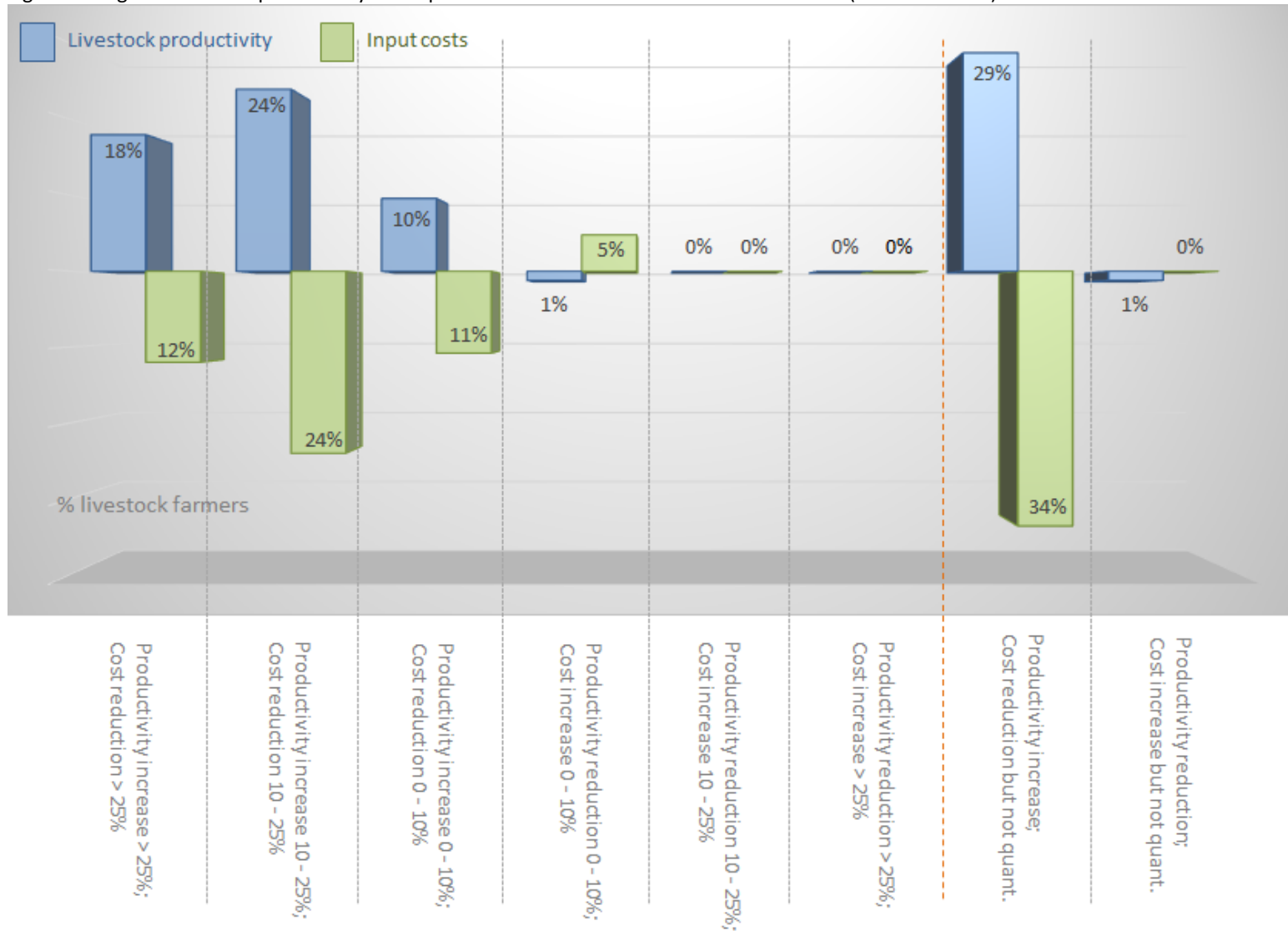


Fig 23. Damage avoided as a result of forecast-based decisions (user estimated)

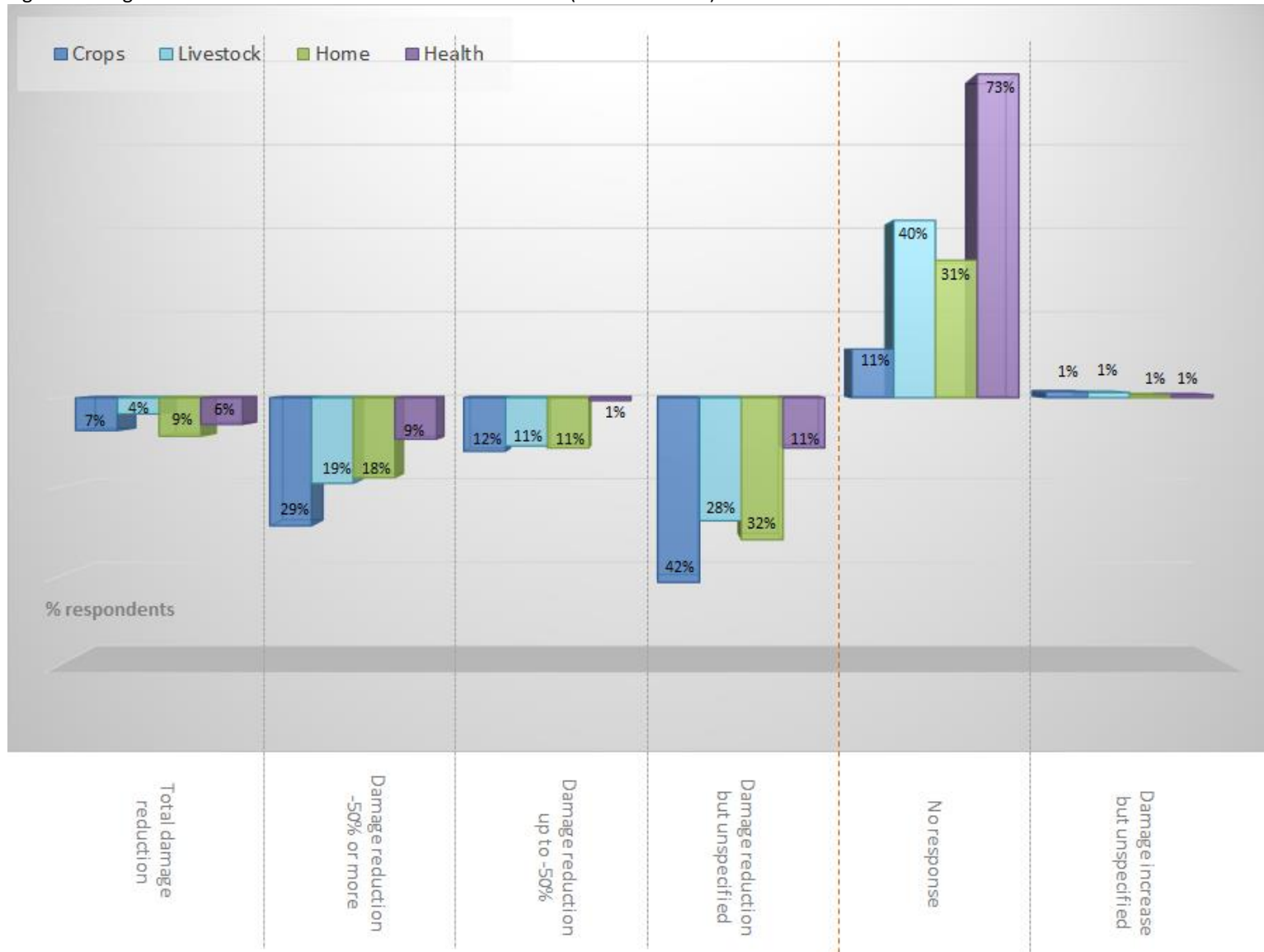
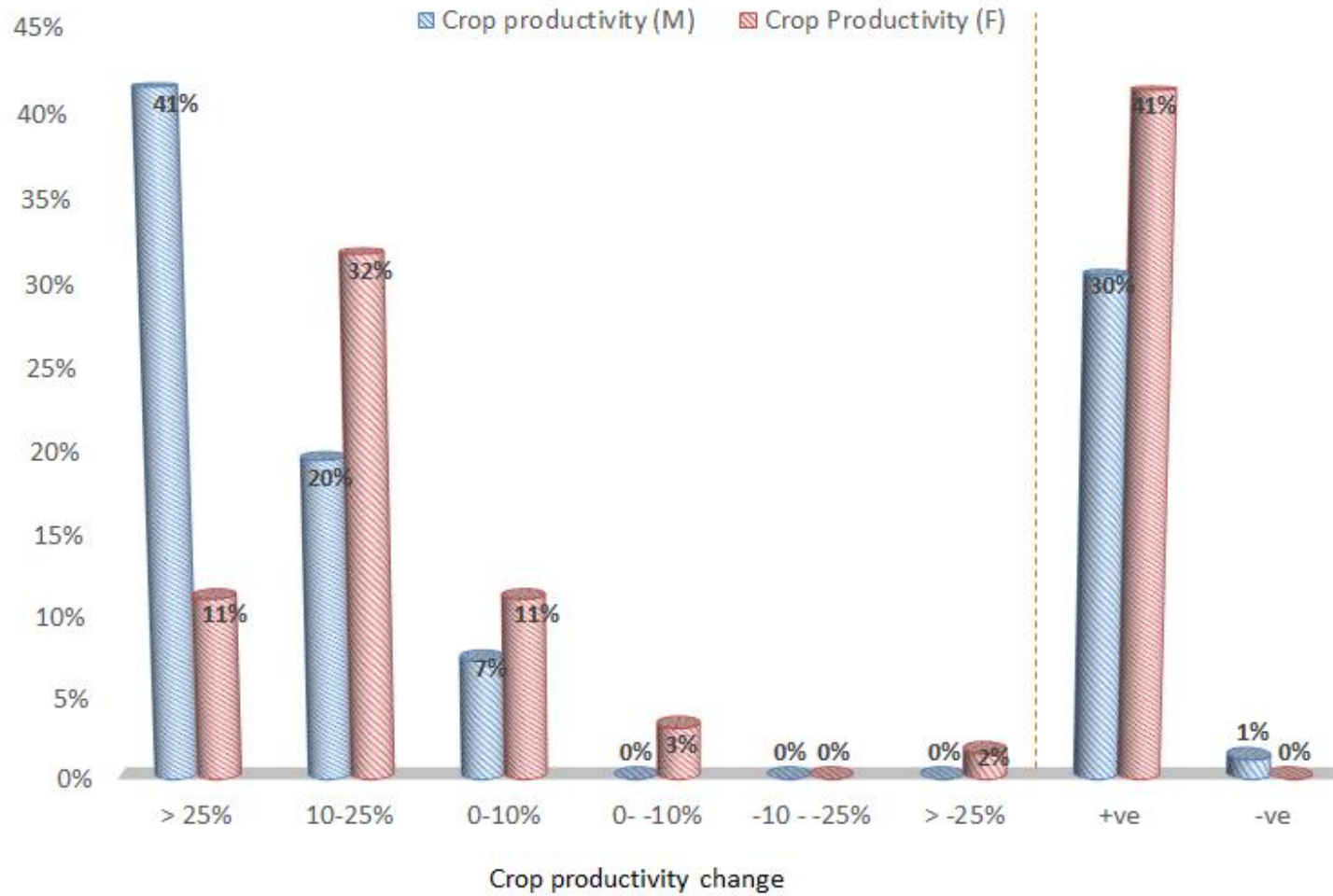


Fig 24. Crop productivity responses differentiated by gender



Differentiating productivity improvements by gender showed a tendency for men to estimate higher levels of increase in the highest category, while showing a lower level of uncertainty in attribution although the overall level of positive response is broadly the same (96% +ve for women; 98% +ve for men). This difference was not examined specifically, so the reasons for it would need further investigation. What it does highlight, if men over-estimate and women under-estimate benefits, is the importance of ensuring a gender-balanced sample in the survey process. If there are genuinely increased productivity benefits accruing to men, this may indicate the need for a more pro-active approach to ensuring that women farmers get more and high quality support services and advisory follow-up.⁸ Irosin LGU Agriculture Office, as can be seen from the photo below (on page 38), has a much better gender balance (44% women) than the global average situation, so this difference may also be due to wider imbalances in e.g. women's access to land, credit, etc.

One dividend of CrFS membership mentioned by all groups has been increased activity around marketing. Groups have set up trading centres to sell commonly-used goods such as food and domestic consumables, as well as group production of e.g. compost and rice. One group described how manure is bought from local dairy farms for P20 per bag, mixed with waste from rice hulling and processing and retails at P250-300 per bag. Sustainably-produced local rice attracts a 30-40% price dividend due to consumer preferences for taste and quality, which translates as P55 versus P35 per kilo for conventional rice.

A CrFS trading centre



When subjected to a simple regression analysis (for those responses confirming a quantified change, to the left of the orange line in Figs 21 and 22), both crop and livestock productivity increases are significant at the 95% confidence level. Livestock input cost reductions are also significant at this level but other input-related reductions – crop inputs, marketing and labour costs – are only significant at the 90% confidence level. The responses for damage avoided showed no statistical significance, mainly due to difficulty for interviewees in attributing anything other than unspecified damage reduction.

2.6 Local knowledge

Focus group discussions revealed a variety of local climate indicators that are used in the community, mostly focused on short-term forecasting.

Fig 25. Local indicators

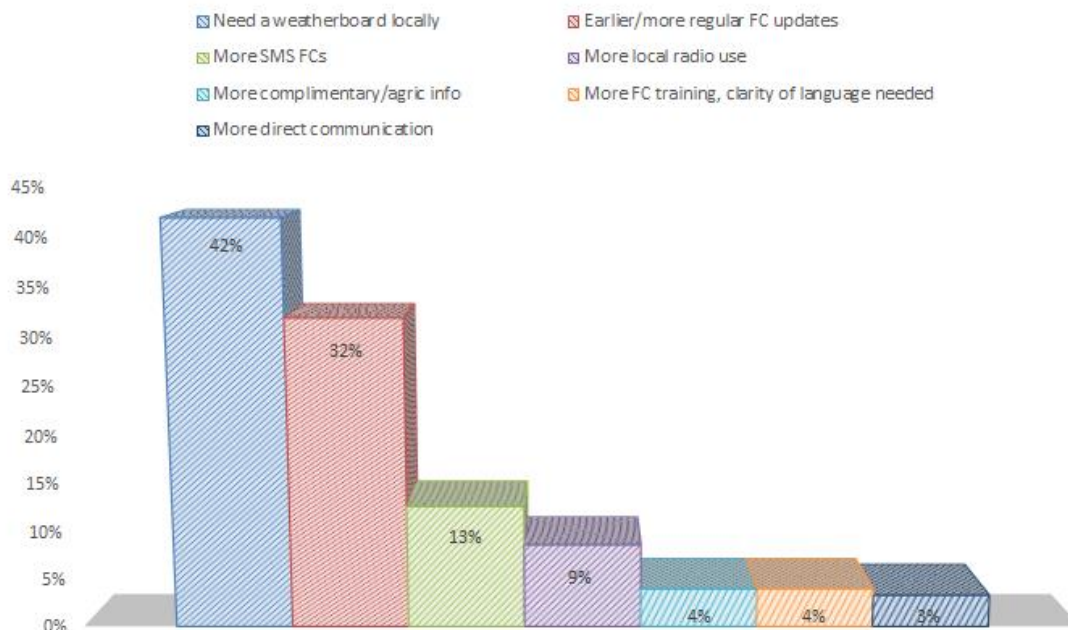
	Indicator	What it signifies
1	Frogs croaking loudly	Rain within a week
2	Ducks flying high	Storms/typhoon in 3-5 days
3	Red or black ants climbing trees/up houses	Heavy rain in 2-3 days
4	Ants store food	Rainy season is coming; the higher up the store, the higher the rainfall
5	Ants leave anthills (but don't go up)	Hot weather coming
6	Moon phase	Full moon = rain next day
7	Branches break on trees	Bad weather in 2 days
8	Swallows flying low	Rain is imminent
9	Swallows fly into houses	Storm/typhoon is imminent
10	Crickets start singing	Rain is imminent
11	Wet weather on the first 3 days of January	Jan 1 st = wet January; January 2 nd = wet February; January 3 rd = wet March
12	Can hear the waves at 2,000 ft ASL on Mt Bulusan (8 km away)	Dry weather the following day
13	Wind from Mt Bulusan	Bad weather/typhoon expected
14	Appearance of stars	Can see = dry next day; Cannot see = wet next day

For all groups, indicators 1-4 are seen as the most reliable. All are generally used, tend to focus on the next few 1-5 days and are seen as relevant all year round, except 10, which is considered “*quite reliable*”, whereas 14 is not as reliable as it used to be, possibly due to climate change. If there is a disagreement between local indicators and the scientific forecast, respondents indicated that the scientific forecast would be used, but they are “*more sure if they agree*”. In general scientific forecasts give earlier indications of likely conditions, so local indicators tend to be relevant nearer the event. Groups suggested that it might be useful for these local indicators to be included on the 10 day weatherboard forecast, although this would need some agreed quality control process. Some links with geophysical phenomena were also mentioned – a mild earthquake being a signifier of hot weather but a heavy shaking earthquake bringing heavy rain. Members also highlighted other forecast indicators, such as wild animals (snakes and wild pigs) appearing in lowland areas indicating an eruption from Mt Bulusan in the next 2 days.

2.7 Future use of forecasts

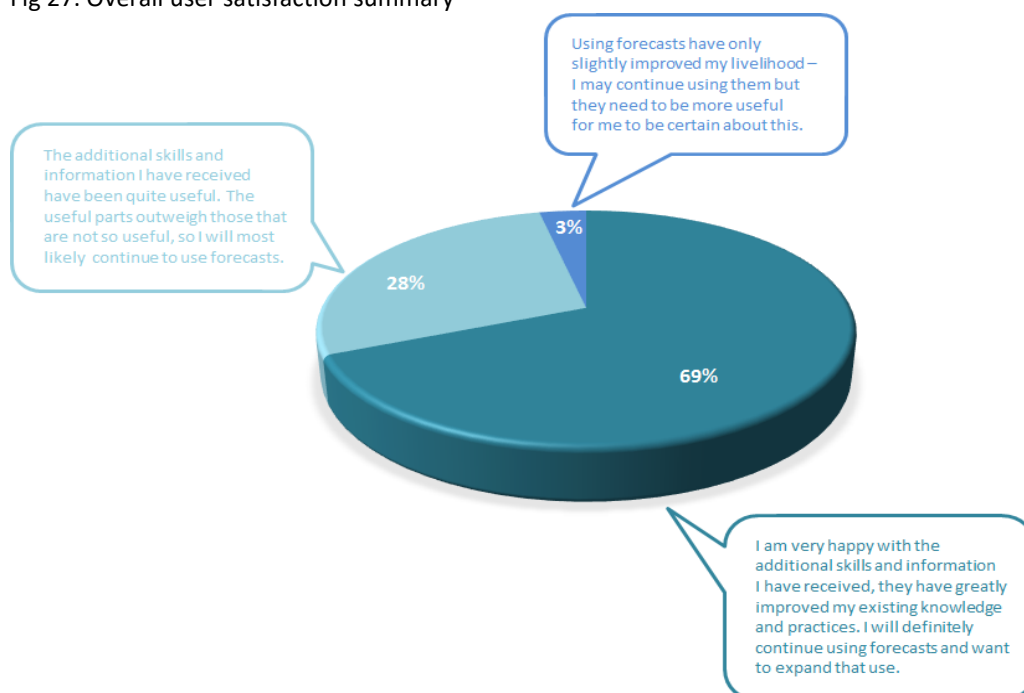
When asked for recommendations to support future use of forecasts, the overwhelming favourite from both formal survey and focus group discussion is “*we need a weatherboard*”. This reflects the popularity of this form of communication and the 10 day forecast it communicates. Focus groups also suggested expanding on this to support CrFSs with rain gauges and other meteorological equipment (even an automatic weather station in one case) so that they can collect and use their own data. PAGASA officials offered a cautionary note on the need to maintain consistency and regular measurement for this to be of any use, something which is not always easily achieved. The other main recommendation is for earlier and more regular forecast updates. Focus groups explained that they had noticed the second 5 day period of a 10 day forecast tended to be less reliable than the first and felt that a mid-point update could help.

Fig 26. User feedback on future improvements



Likewise, few people received a mid-season update for the seasonal forecast, which would also be useful. On increasing clarity, the climate forum where the seasonal forecast is released was highlighted in focus groups as being quite confusing at times and needed to be better explained and related to local agricultural conditions. Expanded attendance at climate forums was recommended but broadly, twice a year was felt adequate with update sessions in between. More use of SMS messages and local radio were both cited as ways of expanding the communication channels for forecasts (FC), in addition to the weatherboards, something that was also expressed in focus groups. Overall, customer satisfaction (see Fig 27 below) is high with 7 out of 10 forecast users confirming that they are very happy with the skills and information they have developed and wish to expand their use of forecasts further. The remaining 30% also see forecasts as useful but need to improve their understanding of both the forecast and the associated advice. There were no responses indicating that CrFs members wanted to stop using forecasts or the advice they get with them.

Fig 27. Overall user satisfaction summary



3. Conclusions and Recommendations

3.1 Conclusions

By virtue of CrFS membership, smallscale farmers receive a variety of forecasts through their groups, with early warning and 10 day forecasts almost universal, seasonal forecasts reaching over 70% and other forecasts getting to over half members. Only long-term climate information and scenarios are reported as reaching a minority of about a quarter of CrFS members, suggesting some scope for enhanced access for this information resource. CrFS membership has also enhanced the way forecasts are communicated, effectively quadrupling the number of channels used by members and thereby significantly contributing to the high levels of access cited above. Particular mention should be made of the weatherboards, which account for nearly two-thirds of climate information received and are by some margin the most requested resource by barangays that are yet to receive them. Although the 10-day forecast is the focus of this communication method, nearly half forecast users also highlight receiving early warning through the weatherboard, expanding access to this important and potentially life-saving information.

Complementary information for both crop and livestock production is highlighted as being essential or important by over 90% of forecast users and together with the forecast, informs a variety of livelihood management decisions to increase enterprise resilience. Of particular importance are choice of crops and crop varieties, timing of planting and input use, managing soil fertility and moisture, anticipatory pest control, livestock health management and harvest timing. Although broadly complementary, the more complex relationship between increased use of forecasts and decisions changed tended to be better revealed through the focus group discussions than the formal survey. This suggested that the seasonal forecast is an important resource for pre-season decisions and motivating the longer-term resilience-building changes around transitioning to more resilient, agro-ecological farming systems and diversifying on-farm production. Some suggestion that increased understanding of long-term climate scenarios also contribute to these changes was detected, but the relatively lower coverage of this information indicates opportunities to focus on this aspect of forecasting, especially as long-term climate scenarios are revised with new climate science, to ensure CrFS members have a full spectrum of forecast understanding from early warning to long-term climate change.

Climate service users describe a clear impact pathway starting with increased access to and understanding of forecasts that, together with complimentary agricultural advice, leads to an increased capacity to make anticipatory livelihood and household decisions. This in turn results in increased production of crops and livestock (significance level 95%), reduced input, labour and marketing costs (significance level 90%) and damage avoided (although this latter category proved harder to measure successfully and therefore demonstrate any statistical significance in the results). Given the close integration of increased access to climate services together with a programme of agro-ecological advice and support on system of rice intensification, crop production and diversification, attempting to define a narrow attribution of impact to climate services is problematic but due to this focus and the improvements in productivity, efficiency of input and labour use, it can be reasonably concluded that the resilience, cost reduction and productivity increase payoffs from forecast provision is substantially magnified through the adoption by CrFS members of these more sustainable farming systems and vis-versa.

The survey did generate a few apparent inconsistencies – for example, the differences between communication preferences and amount of information received through the 7-10 day forecast (Figs 14 and 13 respectively) which had the highest usefulness score. This may reflect a concern that while most and most useful information comes via this forecast and through weatherboards, CrFS



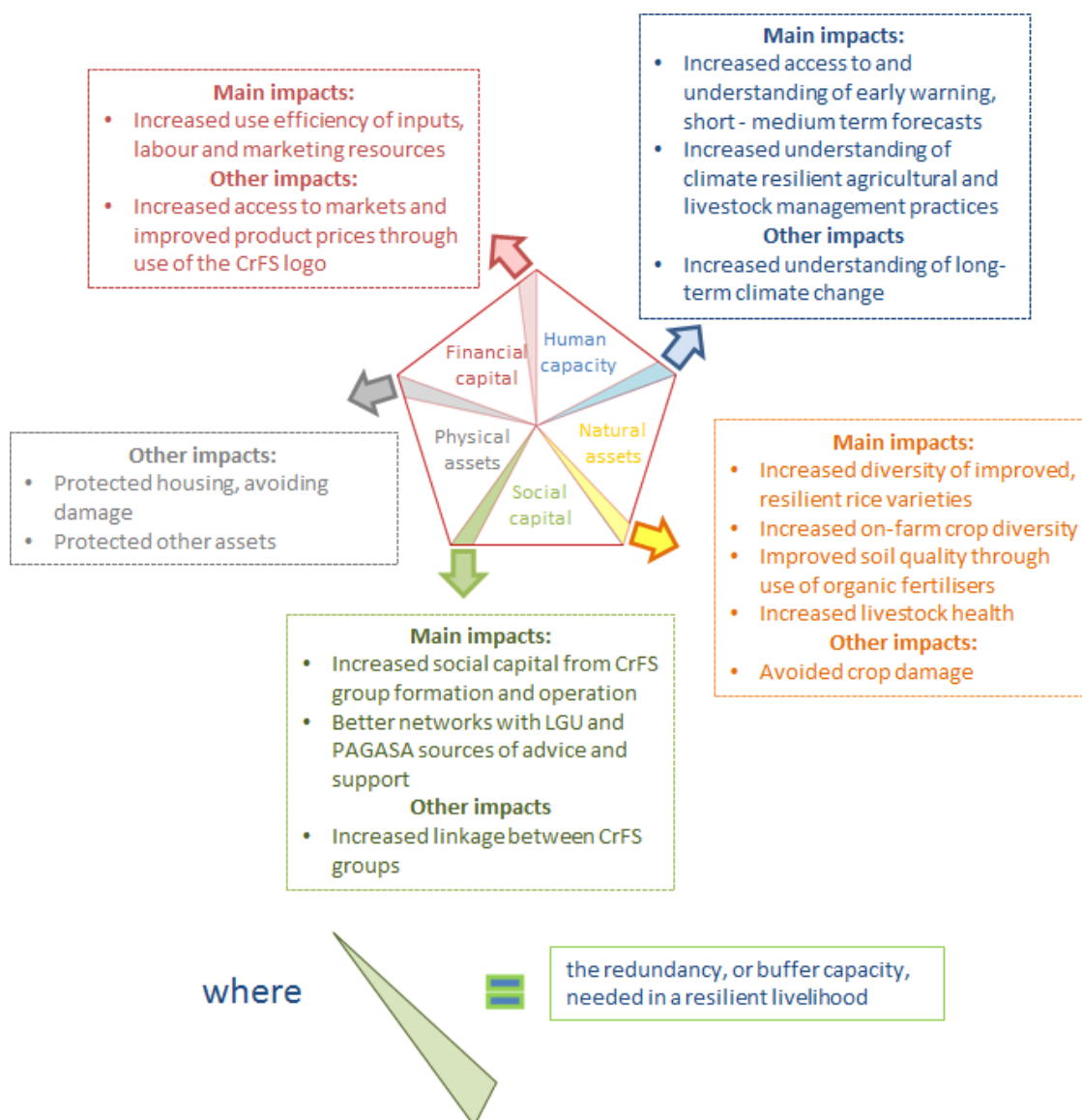
members still like to have access to a wide diversity of channels with an emphasis on interactive methods that would in turn enable them to increase the way they can feedback to climate services and get further explanation. That feedback levels are currently only at 12% suggests further scope for increasing the capacity of the forecast generating system (PAGASA with the LGUs) to interact more with forecast users. This could also help improve the rather low levels of use recorded for long-term climate information and seasonal forecasts, although focus group discussions gave a more positive and detailed picture of the important decisions that are made based on the latter.

The usefulness of climate services and the associated agricultural advice are dependent on a regular and timely supply of forecasts through communication channels that are popular with users. This is clearly the case, with the weatherboard an important resource in this respect. SMS is also widely used and seen as having potential for further expansion.

Not the only hazard – the assessment area at the time of the survey in April 2016 and (inset), two months later in June 2016. 30% of The Philippines' population live within 30km of a volcano.

With the focus of the CrFS approach on enhancing resilience of group members, their communities and enterprises, it is appropriate to draw some conclusions from an asset redundancy/buffer perspective⁹ as to how the approach achieves this (see Fig 28 below). Whilst the entry point is a focus on building human assets (knowledge, etc.), this has clear benefits in enhancing natural, financial and social asset redundancy. Moreover this enhancement is mainly in parallel redundancy resources, with increased access to and understanding of early warning the main improvement for standby redundancy. This improved resilience through enhanced redundancy in turn plays a key role in delivering the increased productivity and reduced input costs revealed by the survey. Interestingly, the benefits of increased early warning coverage through weatherboards demonstrate the enhancement of a standby asset buffer by a parallel asset buffer¹⁰.

Fig 28. Building redundancy in assets to increase resilience – how the CrFS achieves this



3.2 Recommendations

i) Scaling up: the first and most obvious recommendation, given the resilience-building benefits demonstrated by the CrFS approach, is to further examine ways in which it can be significantly scaled up. The 33 current sites would seem to represent a valuable network to achieve this. Challenges to scale-up are always substantial and not to be underestimated – for a group-based approach such as this they can include accessing resources (although the way CrFSs have been embedded in LGU Agriculture Offices and Municipal agriculture budgets significantly mitigates this and enhances sustainability of CrFS support), identifying additional trainers and technical support skilled in farmer group participatory methods and ensuring that the high standards of CrFS support and implementation that make it effective are not diluted through inconsistent or less successful application. These could be reduced through defining a clear scale-up strategy that could include, for example, a continued and substantial technical role for R1 (and other relevant civil society organisations) and expanded peer-to-peer support so that experienced groups can provide advice to new ones.

ii) Access to markets: linked to this is the issue of the CrFS “trademark”. Groups are using this to differentiate their production from “conventional” food and, due to increasing concerns about health impacts and taste preferences for improved local varieties of rice and other crops, are able to attract increased prices from consumers. The cost of official organic certification was regularly cited as unaffordable during the focus group discussions so the CrFS trademark is clearly filling a gap locally. However, as its use expands (and could expand substantially with scale-up) as a marketing strategy, the pressure to define just what standards lie behind the trademark and how they are guaranteed may well increase. It would be better to anticipate this and design a bottom-up approach rather than have these standards imposed from a distant official source at some stage in the future. Linked to this is the need to strengthen members’ skills in crop marketing in order to take advantage of demand for the speciality rice varieties they are producing. Value chain analysis and support for inclusive access to markets would be a logical area to expand the project into.

iii) Climate services: more specifically on climate services, the advice that comes with the forecast is clear for both early warning and the 7-10 day forecast but not so much for other forecasts, which received lower usefulness scores. Focus groups referred to being sometimes confused by some of the seasonal forecast terminology at the climate forums – working with groups to refine how this format can be made more accessible could help overcome this. The relatively low level of feedback from forecast users could also be increased through the facilitation of more structured and regular feedback mechanisms. These could include e.g. a regular review with the LGU, with feedback and recommendations communicated to all stakeholders



Organic fertiliser – just one of the CrFS products meeting growing demand for climate-resilient inputs and food items

iv) Increasing use of long-term climate change scenarios: although respondents identified a variety of long-term changes related to their climate (in Fig 9), their use of long-term climate scenarios as a planning resource was significantly lower than for other types of forecast. This would suggest some potential in focusing on long-term climate change (as per some of the scenarios highlighted in section 1.2) and designing adaptation strategies at CrFS level that can in turn feed into municipal, provincial and regional plans. As these will likely form the basis for future support from the Green Climate Fund, being ready with community-based strategies could increase the chances of attracting resources from this funding source for future CrFS scale-up, etc. It does not seem unrealistic to envisage a CrFS programme at scale, through Government – CSO partnership, being appropriate for GCF support at some stage in the near future as the Fund grows and increases its activities.

Satisfied participants – members of Tongdol CrFS and their weatherboard



3.3 Technical Note

With respect to the methodology, answers to some of the more open-ended questions e.g. around the decision-making processes related to forecast use were not as easily revealed through a formal survey format. Whilst the formal survey broadly triangulated onto the focus group discussion responses, these latter answers revealed a much fuller picture of how forecasts motivate decision-making, which decisions are more amenable to being informed by forecasts and the challenges users face when turning a forecast into a livelihood decision. Unsurprisingly, obtaining a rounded, more complete picture of this process required more time and a more iterative discussion process than was possible through the formal survey. This suggests that keeping to close-ended questions for the formal survey, while using the focus group discussions to concentrate on the open-ended discussion to expand on formal question responses would not result in a significant reduction in information and data quality.

The design of the assessment (a formal survey with focus group discussions) was informed by the need to triangulate and to minimise error and bias. However, these cannot be eliminated from investigation – response could be affected by climate service user perception that by over-emphasising their usefulness, access to forecasts will continue or expand. On the other hand, the focus on climate services as used by CrFS members could have resulted in related aspects of impact valued by users going unmeasured and does not include any impact experienced indirectly e.g. by non-members consulting weatherboards. Likewise, while it was clear from focus group discussions that motivation, empowerment and group cohesion are all important parts of CrFS impact, together with good relations and easy access to LGU support, this was not the specific focus of the research.

Information on productivity, input and cost efficiency and damage avoided were all collected through questions in the formal survey that requested respondents to select from a number of quantitative options, with the same number of positive and negative options. This self-assessment approach was triangulated with focus group discussion questions covering the same measures. Results from both methods were complimentary but it is acknowledged that self-assessment type questions are vulnerable to biases such as the response bias cited above, seasonal bias and biases of

recollection. In general, the strong complementarity between the focus group discussions, the results of the formal survey and background documentation from R1, LGU staff and other organisations strengthens confidence in the results measured here.

Irosin LGU agriculture team with their R1 facilitator Marila Castro



Annex 1. Improved local rice varieties – resilience characteristics and yield (AESA results, 2015)

Varieties	Plant Height (cm)	# of tillers (prod)	# of tillers (unprod)	Lodging resist.	Pest resist.	Disease resist.	Drought resist.	Panicle length (cm)	Grain colour	Maturity (Days)	Yield (Cav/ha)	In MT/ha
Black rice	116	23	1	4	8	7	9	29	Black	115-120	180	9.0
1	108	24	3	7	6	7	9	29	White	115	210	10.5
5A	105	27	6	10	6	7	9	30	White	95-100	200	10.0
GSR8	97	31	4	10	6	7	8	21	White	110-115	230	11.5
Maluwa	125	25	3	4	7	7	7	27	Red	115-117	184	9.2
Redrice	100	21	7	5	8	8	7	23	Red	115-117	164	8.2
Blonde Red	94	33	10	10	7	7	7	26	Pinkish	110-117	204	10.2
Calatrava	106	42	10	6	7	7	7	22	Violet	117-120	160	8.0
RCL	107	30	6	6	7	7	7	25	White	117	224	11.2
Malibo	135	27	3	4	7	7	7	19	Orange	115-117	210	10.5
Selecta	119	23	9	6	8	8	6	28	Violet	110-117	210	10.5
12	103	27	8	9	8	8	9	25	White	115-117	230	11.5
Kayupo	98	33	5	10	8	8	8	25	White	117	204	10.2
Pink Rice	144	38	10	8	6	6	7	26	Or./Pink	117	224	11.2
Maragaya	147	32	5	2	6	6	7	27	Orange	115-117	234	11.7
CC3	130	36	10	3	6	7	7	30	White	115-117	234	11.7
Glutinous	120	23	2	6	7	7	7	28	Violet	115-117	230	11.5
VS Red	115	25	4	6	6	6	6	24	Red	115-117	160	8.0
Tinokio	123	23	2	6	6	6	7	24	White	123	230	11.5
Filita	113	30	7	6	6	6	7	28	White	110-117	220	11.0

Endnotes

- 1 Agricultural data from CountrySTAT Philippines, <http://countrystat.psa.gov.ph/>
- 2 Mapping Philippine Vulnerability to Environmental Disasters, <http://vm.observatory.ph/findings.html>
- 3 Rice Farming in The Philippines: Some facts and opportunities – Bruce Tolentino, Deputy Director-General, International Rice Research Institute (IRRI, September 2015).
- 4 See <http://philippinericeinfo.ph/data-products/region-5-2015-2nd-semester/>
- 5 See Berkeley Earth <http://berkeleyearth.org/> for a comprehensive assessment of land + ocean temperature data.
- 6 Climate Change in The Philippines – PAGASA/Adaptayo (2011).
- 7 Climate Resiliency Field School Workbook – R1.
- 8 See Christian Aid's [Climate Resilient Agriculture Briefing](#) which highlights that globally, only 15% of agricultural field advisers are women and only 5% of female farmers receive technical advice. Officially 19% of farms in The Philippines are women-headed (IRRI).
- 9 See Measuring Resilience Impact – Christian Aid (2016), esp. Chapter 2, section 2.1, for more on redundancy, buffers and parallel/standby redundancy assets.
- 10 Standby buffers (or redundancy) are only used in the event of a shock; parallel buffers are assets that are in at least partial use in “normal” conditions but are particularly useful in building resilience to shocks and stresses.