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Bundling Agricultural Services under Seeing Is Believing and Plantwise: Benefits and Opportunities

Summary

The Seeing is Believing (SIB) project builds on the Plantwise (PW) programme and provides picture-based advisories (PBA), i.e. remote advice to farmers based on picture-based crop monitoring. Farmers registered in the SIB project send images of affected crops and repeat images of the fields via mobile phone using an app. Plant doctors assess the images and provide plant health advice to farmers by messages on their registered mobile numbers. Farmers are provided with different management options, based on the severity of crop damage. During the third season of the project, 350 farmers from 70 villages in Pudukottai and Thanjavur, were targeted with PBA. 175 farmers received a bundled service of PBA and picture-based insurance (PBI), with insurance pay-outs based on any visible damage in the field images uploaded by the farmers. The other 175 farmers only received PBA. Plant clinics (PC) were run in all the 70 village locations covered under SIB.

This study brief sets out the findings of an evaluation carried out in December 2020 on the bundling of services under PBA, PBI and plant clinics. The aim of the study was to understand the importance and usefulness of advice given through PBA and plant clinics and to assess farmer benefits from receiving the bundle of services, identifying the synergies between the different services. A total of 240 respondents were interviewed who received advice from PCs, PBA, PCs and PBA, PCs, PBA and PBI, with farmers stating they benefitted with increased crop yield and reduced pest and disease infestation through implementing the advice received through all the services provided (PC, PBA and PBI). The study found that the services (PC and PBA) complemented each other, with farmers preferring different aspects of each service. At present PBA is seen as an add-on to the Plantwise service, rather than a stand-alone service, in particular as it relies on plant doctors for advice provision. The PBI elements provided additional perceived benefits for farmers, though the cost of the service needs to be further explored.

Highlights

- Most respondents appreciated both plant clinic and PBA services and stated that both services had advantages. Plant clinics were preferred in terms of ease of access, usefulness of advisories and ease of understanding and PBA in terms of timely provision of advisories.
- The greater the distance the farmer is from the plant clinics, the more they preferred PBA services over plant clinics with regards to ease of access. Women farmers in particular preferred the PBA service over plant clinics, as they found it difficult to travel to the plant clinics.
- Though PBA has only been offered to farmers for a short time period as compared to plant clinics, 95% of farmers were satisfied with the services received overall and 78% would like to access PBA services again.
- The bundling of insurance with advice increased the interest of farmers in the uptake of the advice, and farmers were keen to invest more in agriculture inputs due to the insurance component.
- A hybrid model for loss assessment that includes area-yield insurance combined with images to cover localized damage would depict both localised as well as large scale risks in farming at the farm scale.
- The insurance premium currently paid by the project on behalf of farmers is much more than the willingness to pay by the farmers.

Context

The Seeing is Believing (SIB) project is run by CABI in partnership with the International Food Policy Research Institute (IFPRI) and M S Swaminathan Research Foundation (MSSRF), built on the CABI-led Plantwise programme, and started in May 2019 with the aim of providing remote pest and disease management advice to farmers based on picture-based crop monitoring. The farmers register their fields on a dedicated mobile app and send images of

affected crops (closeup images depicting any visible damage to the crop) and weekly repeat images (overview pictures depicting the growth of crop) of the fields, to help plant doctors identify the growth pattern of the crop to identify the cause of any damage and also give general preventive and yield improving advice. The MSSRF plant doctors, trained through Plantwise, provide plant health advice to farmers through mobile messages after assessing the images received via mobile phone from farmers. Farmers are presented with different management options for pest and disease control, based on the severity of crop damage. The remedial options sent to farmers are based on information created by subject matter experts and which includes the best management options for each pest and disease based on the growth stage of the crop. Along with the curative options, the messages also include general preventive measures throughout the growing season, based on resources in the Plantwise Knowledge Bank.

During the third season (Kharif 2020) of the project, work continued in two project locations (Pudukkottai and Thanjavur districts) in Tamil Nadu, covering 350 farmers (19% women farmers) growing paddy (rice) and groundnut from 70 villages (Pudukkottai, 50 and Thanjavur, 20). The component of PBI was introduced as part of the SIB project with insurance coverage offered by HDFC Ergo insurance company in partnership with IFPRI. The images received throughout the season were used by the plant doctors to assess the crop damage and the data was sent to the insurance company to provide insurance pay-outs to the farmers as appropriate. Each farmer's site was assessed individually by three plant doctors and the damage assessments were compared. Where the plant doctors did not agree, a second round of assessment was carried out by the plant doctors together in order to reach consensus. Of the 70 villages involved in Season 3, 35 villages received the PBA service only and 35 received both PBA+PBI. In each village, five farmers were engaged in the study totalling 175 farmers receiving PBA and 175 farmers receiving PBA+PBI. All these farmers were also able to access plant health advice through attending plant clinics. For the PBA and PBI, field volunteers helped the farmers to take the repeat and close-up images. In addition, most farmers were already covered under the government run crop insurance scheme of *Pradhan Mantri Fasal Bima Yojana* (PMFBY) which covers crop losses due to abiotic risks (seasonal drought or flooding) or any new epidemic pest infestations like fall armyworm. PMFBY uses an area-yield index (i.e. average yield per unit area) to measure the crop losses.

What we did

Study design and sampling

In order to assess the benefits and potential opportunities of providing a combination of services (PC, PBA and PBI), a survey was carried out focusing on groundnut and paddy farmers in Pudukkottai district and only paddy farmers in Thanjavur district. The target farmers received advice through either the SIB project or PW, or both. A total of 240 respondents from those involved in the Season 3 project activities were randomly selected through computer generated numbers for this study and classified under three different groups:

1. Those using picture-based advisories and were able to access plant clinic services – PBA+PC (80 farmers)
2. Those using picture based advisory services and picture based insurance services and were able to access plant clinic services – PC+PBA+PBI (80 farmers)

- Those just using plant clinic services and not registered for PBA or PBI services – PC (80 farmers)

The plant clinics were available and accessible to all the farmers in groups 1 and 2 (PC+PBA and PC+PBA+PBI) but not all of them had actually used plant clinic services, therefore the sample size in each group for some analysis is slightly reduced.

Data collection and analysis

The quantitative evaluation study focused on understanding the benefits, key learnings and challenges faced by farmers when using the individual or bundled services they obtained from PW and SIB. The survey was conducted in December 2020 telephonically by five enumerators and the ODK app was used to collect the survey responses from the farmers. A detailed questionnaire was prepared and the enumerators were trained to collect the data to ensure harmonization in data collection. Farmers' consent was taken before starting the data collection process. Each survey took approximately 1- 1.5 hours. Use of ODK enabled data quality checks as the survey progressed, to ensure answers for instance were in the expected range, or addressed the question asked. The data were analysed through descriptive statistics and t-tests using MS Excel 2010.

What was achieved?

The importance and usefulness of advice given through PBA and plant clinics

Overall, 90% of the PC farmers (n=191) and 81% of the PBA farmers (n=160) stated they had adopted the advice provided to them for the specific problems presented. 36% of farmers using plant clinics as well as PBA confirmed that the damage due to insect pests was reduced. This was followed by increased crop yield, according to ~24% of those using PC services, and ~29% of those using PBA services. In addition, ~16% farmers from both the categories observed that the risk of crop failure due to pests and diseases was considerably reduced. The benefits experienced by farmers through plant clinic advice and picture-based advisories are shown in Table 1. Both plant clinic users as well as those farmers using PBA were asked the same questions in relation to each service separately.

Table 1: Percentage of farmers stating benefits obtained from use of plant clinic advisories and PBA*

Advisory services	Reduced pest damage	Increases crop yield	Decreases the risk of crop failure	Reduced crop damage (from other sources)	Reduced/ more focused use of pesticides	Others
PC (n=191)	36	24	16	13	7	3
PBA (n=160)	36	29	16	9	5	5

* Multiple answers allowed

The survey showed that 82% of farmers (n=191) who received plant clinic advice and 73% of farmers who received PBA (n=160) have changed their approach to pest and disease management. The surveyed farmers reported they have adopted need-based fertilizers and chemical/ biological pesticides. They were more aware of the choices of chemical/ biological pesticides and also changed the type of pesticides used as per the recommendation of the plant doctors. These changes contribute to rational use of pesticides.

A t-test showed that there is a significant difference in crop yields between the farmers who followed the plant clinic advice and those who did not (Table 2). A similar t-test was conducted with the farmers who did or did not adopt picture-based advisories. For this category, there was no statistical difference between the quantity harvested and adoption of advice. This may possibly be due to the more targeted advice, based on actual plant samples, that farmers who visit plant clinics receive, as compared to slightly more general advice received through the PBA service. However, this would need further investigation as there may be other confounding factors affecting these results, such as an unbalanced sample, which may be affecting the t-test results.

Table 2: T test between the PC advice and PBA advice applied and not applied for quantity of harvest

Variable		N	Mean	Std. Deviation	df	t-Value	Statistical significance	
Quantity harvested	PC Advice applied	176	1832.6	2978.48	42	2.86	0.006	P<0.05, significant
	PC Advice not applied	23	1101.7	1731.67				
Quantity harvested	PBA Advice applied	131	1600	2613.53	63	0.48	0.62	P>0.05, not significant
	PBA Advice not applied	29	1441.3	1440.73				

Benefits from providing a bundle of services: advice (PC and PBA)

Around 85% of the farmers who attended plant clinics and were enrolled in the SIB project (n=111) responded that they would recommend the plant clinic services, while ~98% of farmers in the only plant clinic group (n=80) responded that they would recommend the service to other farmers. The farmers found the plant clinic service useful and appropriate advice was provided by the plant doctors. Some farmers stated that the plant doctors helped them understand the problems as compared to agro-dealers (a major source of information for advice and agro-inputs) who try to sell their products to the farmers.

84% of the farmers benefited from using both PBA and plant clinic services. 43% of farmers preferred PBA and 57% of the farmers preferred a personal visit to clinics when given the choice between any one of the services. The major reason for preferring plant clinics is a better understanding of the problem due to face to face interaction with the plant doctors and other farmers in the village as well. Interestingly, more women preferred PBA (80% of women respondents preferred PBA, while 35% of the male respondents preferred PBA). This clearly shows the advantage of remote advice for women farmers.

The preference of the farmers for a particular service was analysed with respect to their distance from the plant clinic. The results demonstrated that among the two services, farmers preferred plant clinics in terms of ease of access, usefulness of advice and ease of understanding, and PBA in terms of timely provision of advice (Table 3). When the data was analysed in terms of farmers' preference against distance to the plant clinic, it was observed that more farmers preferred PBA as the distance from a plant clinic increased. Regression analysis showed that ease of access and ease of understanding ($p < 0.05$) are dependent upon the distance of the farmer from plant clinic. No other service characteristics indicated any dependency to the distance the farmer was located from the plant clinic. It is logical that farmers' ranking for ease of access is dependent on the distance from the plant clinic, though it is unclear why the ease of understanding ranking should also be dependent on distance. This needs further investigation.

Table 3: Percentage of farmers who prefer plant clinics v/s PBA with respect to distance from plant clinics (n=111).

Distance to Plant clinics (km)	Which service would you prefer if you had to choose between the two?		Preferred choice of service, based on service characteristic							
			Ease of access		Usefulness of advice		Timely provision of advice		Ease of understanding	
	<i>Plant clinics</i>	<i>PBA</i>	<i>Plant clinics</i>	<i>PBA</i>	<i>Plant clinics</i>	<i>PBA</i>	<i>Plant clinics</i>	<i>PBA</i>	<i>Plant clinics</i>	<i>PBA</i>
<5	60.9	39.1	60.9	39.1	62.1	37.9	49.4	50.6	66.7	33.3
5 to 10	47.4	52.6	31.6	68.4	42.1	57.9	52.6	47.4	47.4	52.6
>10	20	80	0	100	40	60	20	80	0	100

Benefits from providing a bundle of services: advice and insurance (PBA and PBI)

For the PBA enrolled farmers (n=160), 95% of them were satisfied with the services received overall and 78% would like to access the services again. Approx. 75% of farmers would recommend the services to other farmers due to the ease of access to advice, the time saving methodology as compared to visiting plant clinics, and the appropriate and useful advice they received for their plant health problem based on the sent images. Interestingly, the farmers registered for PBI (n=80) were more interested in using the services again than the 'PBA only' farmers (n=80) and also perceived more benefits of the scheme (Figure 1). The PBI increased the interest of the farmers in the project as compared to those farmers enrolled for PBA only. Those who stated that they would not recommend the services to others were either not interested in the services or they found the process difficult to explain to others. Some farmers also stated that they are sceptical about the insurance pay-outs and thus want to be sure before they spread the word about the interventions.

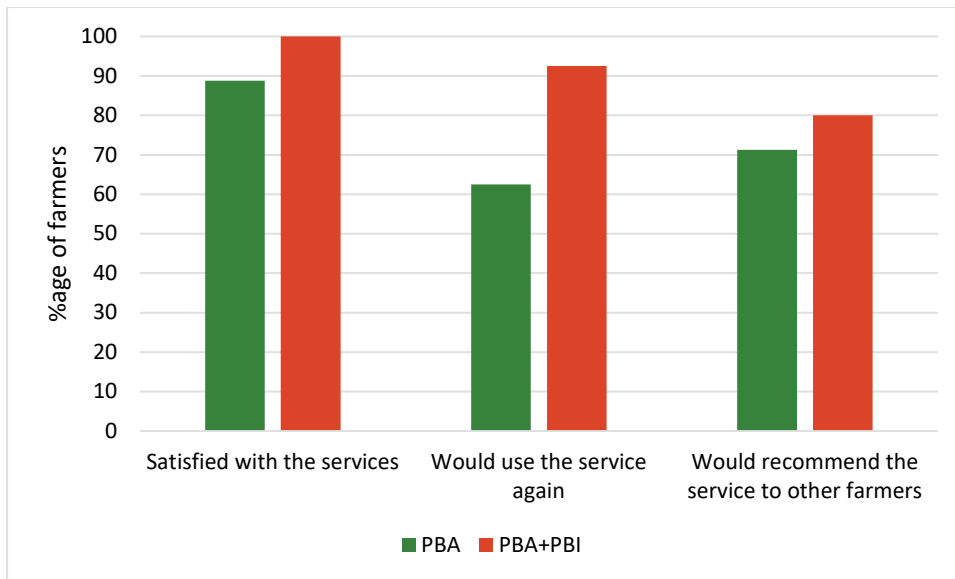


Figure 1: Satisfaction of farmers using PBA (n=80) v/s PBA + PBI (n=80)

Survey results indicated that bundling of PBA with PBI increased the interest of 95% of the farmers in the project and 82% of the farmers were keener on adopting the recommendations due to the risk coverage provided through the insurance component. The insurance pay-out gives them confidence to apply the advice and adopt new practices. 71% of PBA+PBI (n=80) farmers were willing to change their agricultural practices if they were part of the insurance scheme in the next season. This included investing more in agro-inputs and growing different crops, as well as following the advice given and increasing their engagement with the SIB project (Figure 2).

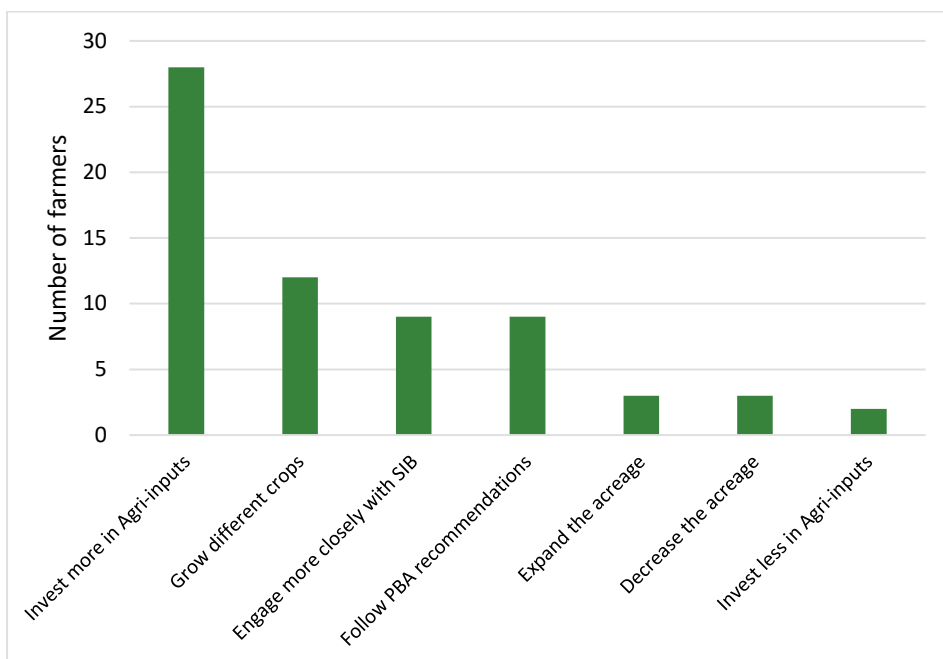


Figure 2: Desired changes in farmer agriculture practices if insurance provided in next season (n=80)

Comparison between loss assessment method for PBI and PMFBY

In the PBI service, a portal was created with all the repeat and close up images sent by the farmers throughout the season along with the advisory history sent to the farmers by the plant doctors. The damage for each site was individually assessed by three plant doctors who, based on the damage visible in the images, provided the loss damage % and area affected %. The final damage level was calculated as follows:

$$\text{Damage level} = (\% \text{ Loss due to damage} \times \% \text{ Area Affected})/100$$

Table 4: The insurance pay-outs based on damage category in PBI

Damage level	Less than 20%	Between 20% and 50%	Between 50% and 75%	More than 75%
Damage category	1	2	3	4
Sum insured (Rs. 30,000)	No pay-out	Rs. 10,500	Rs. 19,500	Rs. 30,000

Rs. Exchange rate

The insurance premium (maximum amount payable by the farmers) in the PBI scheme is 10.6% of the sum insured which is Rs. 3,180/acre (44 USD) for the insured sum of Rs. 30,000. In the current season the insurance premiums were not paid by farmers but incurred by the project.

48% of the PBA+PBI farmers (n=80) are willing to pay for insurance with the price ranging from Rs. 200/ acre (2.76 USD) to Rs. 1000/ acre (13.78 USD). The average price that the farmers are willing to pay is approximately Rs. 400/ acre (5.6 USD). This amount that the farmers are willing to pay is considerably less than the current premium rates and thus points to the need of scaling up of PBI to lower the premiums and make it affordable for the farmers.

Farmers were asked which method captures the different types of damage best, images (PBI) or the average yield of the area (PMFBY method) (Table 5). Interestingly, farmers perceive that pest and disease losses can be captured well by the images whereas the drought and flooding induced crop losses are better captured through average yield method, suggesting that localized damage is better captured through the images as compared to the non-localized damage like drought and floods. This calls for a hybrid insurance model to be adopted that uses a mix of images and average yield methods to create a holistic model to capture both localised as well as large scale losses incurred by the farmers.

Table 5: Preferred assessment method for different damage types for farmers registered in PBI (n=80)

Type of damage	Images (PBI)	Average yield (PMFBY)
Pest and disease attack	60 %	40 %
Floods	26 %	74 %
Drought	37 %	63 %

The way forward

Plantwise is an established programme in the area of study while PBA, including PBI is a new service and therefore it is hard to make a direct comparison between the services due to the varying familiarity and length of time that farmers have engaged with each service. However this study of paddy and groundnut farmers in Pudukkottai and Thanjavur Districts of Tamil Nadu has led to the following observations on which a way forward can be planned.

- Most respondents valued both plant clinics and PBA, and stated that both the services had advantages. Most farmers preferred physical plant clinics over the virtual plant clinics. Plant clinics were preferred in terms of ease of access, usefulness of advisories and ease of understanding and PBA in terms of timely provision of advisories.
- The better understanding achieved through face to face interactions in plant clinics should be considered going forward in SIB. The options of providing voice recordings of plant doctor diagnoses, recommendations and explanations to the farmers with follow up calls by plant doctors should be explored to increase the interaction between farmers and the plant doctors.
- Women farmers preferred PBA service over plant clinics. The reason is they find it difficult to travel to the plant clinics, which shows clear evidence of the ease of access of PBA services in providing remote advisories.
- The bundling of insurance services with advice increased the interest of the farmers, and they were keener to apply the advice received. The farmers enrolled under PBI clearly perceived more benefits from the SIB service as compared to the ones not registered for PBI.
- The farmers were also keen on investing more in agri-inputs and investing more in agriculture if registered for PBI in the next season. This shows how bundling of services would help in the investment in the agriculture sector by the farmers.
- The willingness to pay for the insurance services by the farmers is less than the actual premium for the service which needs to be addressed going forward.
- There is evidence of the need for an area-yield insurance index, combined with images to cover for localized damage, to create a holistic insurance product that captures both localised and overall damage to the fields.

The PBA service is a complementary service to Plantwise rather than a stand-alone service, delivering advice through trained plant doctors, and making use of Knowledge Bank information. However this study shows that PBA could make a significant impact, as a PW add-on, by providing farmers with correct, timely and useful advice without a need to travel. Additional seasons of running SIB, with both PBA and PBI would help to build more confidence among farmers in the service. In general farmers feel confident in applying advice as well as investing more in agriculture due to the insurance component providing field scale coverage.

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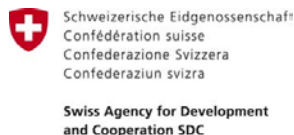
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