Research article

Farmers Perceptions on the Causes and Effects of Cassava Witches' Broom (CWB) on Cassava Production in Three Provinces of Cambodia

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Abstract Cassava production in Cambodia has been increasing due to favorable market and agro-ecological conditions. However, damage to cassava crops by pests is posing significant concerns, due to the impact on yield and starch quality. Among the most important diseases is Cassava Witches' Broom (CWB), that has only recently been identified in Cambodia which is increasing in severity, and for which there are limited control. A survey on causes and effects of CWB was undertaken in 2015 with 150 cassava growers in the three provinces of Kampong Cham, Prey Veng and Svay Rieng. A further 30 cassava farmers participated in a focus group discussion. The main objectives of this study were to get an understanding of the current level of damage caused by CWB on cassava production, the causes of the disease, and the control measures taken by the respondents in relation to the disease. CWB is perceived by cassava growers as the most serious disease in their cassava crops, potentially causing more than 50% decline in tuber yields (from an average of about 19.5 t/ha in a normal year, to 8.5 t/ha in a year of CWB infection and damage). From the perceptions of respondents, four reasons were given for the incidence and damage of CWB. These included, poor soil fertility (28.70%), drought (28%), the side effects of pesticide use (20%), and the quality of planting materials/varieties planted (18%). Even though these are the reasons provided by cassava farmers, they do not have the capacity to control the disease, despite the following initiatives: pesticide application (55%), change to CWB resistant varieties (15%). Farmers reported that pesticide application is not an effective strategy to control CWB, and recommended that improved agricultural extension services could help them get access to CWB resistant varieties, as well as to address other production issues, in a timely manner.

Keywords Cassava Witches' Broom, cause, effect, cassava production, poor soil fertility

INTRODUCTION

In Southeast Asia, cassava is the second most widely cultivated crop after rice. The crop supports an estimated of 40 million people, and underpins steadily growing local starch and biofuel industries (ACIAR and CIAT, 2013). Cassava is of growing importance, since it is regarded as a food security crop. It is either consumed directly, processed, or cultivated as a source of income for the poor (Hoat, 2014).

The cross-border trade of cassava is also well known, since the Cambodian cassava provides feedstock for the processing sectors in Vietnam and Thailand. The value of cassava products traded from Cambodia is estimated to cover USD250 million per annum (El, 2008). However, the rapidly emerging pests and diseases problems pose a significant threat to farmer's yields and income, as well as to the local industry. A key threat of Cassava Witches' Broom disease (CWB), has been threatening up to 40 million small holder farmers in Southeast Asia who have strong dependence on cassava to support their livelihoods. Witches' Broom is a disease that spreads through contaminated cuttings, and can also be transmitted by insects. The most common symptoms are the presence of dwarfism in the plants, small leaves along the stem, and lower quality cassava roots. The disease has been detected in Vietnam, Thailand, Cambodia, Laos, Indonesia, and the Philippines. The impact of CWB is clear: it increases the loss margin between 10 and 15% (but as high as 50%), with starch content being reduced by 25 to 30% (CIAT, 2015a; 2015b).

Even though CWB was first reported in Cambodia as recently as 2009, it has been causing severe damage in cassava plantings, especially during the early wet season. In Cambodia, CWB is currently the most serious disaster for cassava farmers. Since the disease has a direct impact on farmer incomes, it is very important that action needs to be taken to equip cassava growers with some capacity to control the disease. In addition to the CWB constraint, cassava is usually cultivated by poor farmers without having access or knowledge to fertile their land. These marginalized farmers can often suffer from crop losses due to their limited capacity to address pest and disease issues. These ultimately lead them to become in-debt, resulting in asset sales and landlessness (Cambodia Daily, 2014).

This study has been conducted with 180 cassava farming households in three provinces of Prey Veng, Svay Rieng and Kampong Cham to understand the current status of their cassava production, particularly to identify the causes and effects of CWB on this crop production.

METHODOLOGY

Samples for the survey were selected from the three districts of the three provinces named above. The survey randomly selected 150 respondents in the survey areas, with approximately 50 households being randomly selected from each of the survey districts. To ensure representativeness and accuracy of the data, the survey employed both quantitative and qualitative methods which allowed information from both approaches to be cross-checked. From the quantitative side, the questionnaire tool was designed to accommodate individual interviews with cassava cultivating households in the target area, while from the qualitative side, group discussion interviews were conducted with another 30 experienced cassava farmers so that the discussion could be directed to cover the topic of the study.

For the individual interviews, the survey samples were selected from cassava growing households in the three provinces. A questionnaire involving, 32 questions was designed for this household survey. The questionnaire contains both typical and critical questions ranging from the general bio-data to the status of cassava production, the causes and effects of CWB production, and other technicalities related to the management of this disease.

Epidata Software was used to build a data entry template and the data was further exported into SPSS Software for final cleaning and analysis. Basic statistical procedures include frequency, cross-tabulation, multiple responses, numeric descriptive statistic, and pair sample T-Test which were applied in the quantitative data analysis.

RESULTS AND DISCUSSION

Causes of Cassava Witches' Broom Occurrence in the Community

Farmer perceptions on the of CWB disease in the target communities were recorded in terms of respondents perceptions as to reasons for the CWB outbreaks in the last two years (2013-2014). The reasons provided were within the context of the knowledge and observations of farmers. Roughly 28% of households claimed that among the contributing factors were poor soil fertility, drought, and other unknown reasons. Around 20% of respondents mentioned that the outbreaks of CWB might be related to the use of chemical pesticide and fertilizer, while another 18.7% believed that the incidence of the disease was based on the use of contaminated planting material. A small proportion (ranging from 6% to 8%) of households reported that the cause of CWB could be due to sources of planting material, and insect outbreaks (Fig. 1).

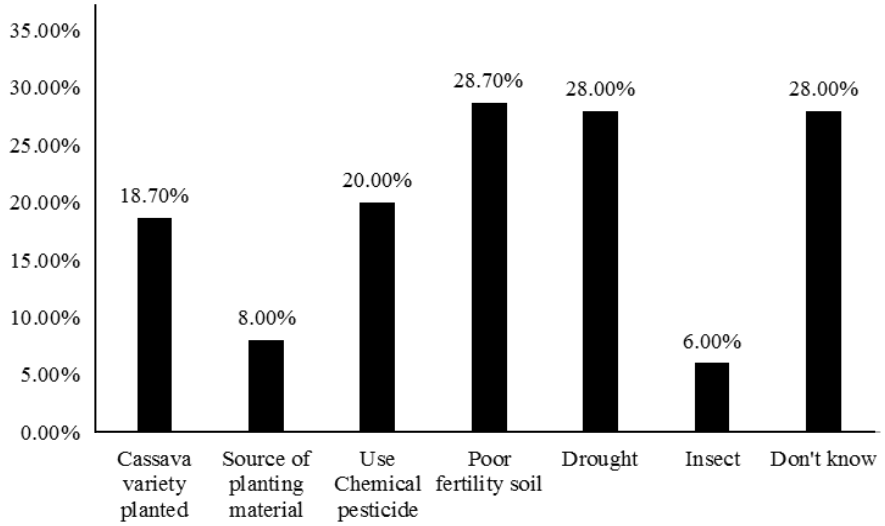

Fig. 1 Farmer perceptions of the causes of CWB in the survey target areas

Effects of Cassava Witches' Broom Disease on Cassava Production

Witches' broom disease attacks the starch in cassava roots, and looks set to aggressively spread unless farmers take action on time. In Cambodia, the disease results in 10-15% yield loss when compared with normal yields (CIAT, 2013). This spells disaster for farmers. The same source also adds that the disease remains a major problem since Cambodian cassava growers often import cassava planting material from Vietnam, especially during the planting time in April. The disease is more prevalent in Vietnam and the use of the Vietnamese planting material is the main source of the disease in Prey Veng and Svay Rieng provinces which have borders adjoining Vietnam.

Regarding the impact of CWB on cassava cultivation, each household covered by the survey was asked to quantify the damage in relation to different aspects of cassava production, including land size, yield per hectare, price per kg, bunches per hectare, and price per bunch. The level of impact of each parameter was estimated by comparing the production in normal years with production in years when CWB has affected the cassava crop on the same unit of land.

To understand the cassava crop production losses caused by the CWB disease, land size, price, and yield during a normal year were compared to those in a year of CWB infection. Regarding to the proportion of land infected by CWB, those households that encountered the disease reported that nearly all of their land (99%) was affected by cassava witches broom disease. In the years of infection, nearly all of the respondents (98.7%) received significantly lower cassava tuber yields when compared to the production in a normal year. In reference to price, the CWB affected cassava was sold at a lower

price than for the produce from healthy cassava crops, with 84% of households reporting a 40% lower price than for uninfected crops in a normal year (from 200 to 280 riel/kg) (Table 1).

Table 1 Growing area, yield and price of cassava in normal and CWB affected years

Items	In normal year	In affected year	Significant
Growing area (ha)	2.22	1.37	0.00**
Yield (kg/ha)	19,591	8,520	0.00**
Price (Riel/kg)	280	200	0.00**

The symbols (**) indicate a highly difference significant

Farmers' Actions after First Observe Cassava Withes' Broom Disease in their Crops

Cassava farmers have applied many techniques to control the CWB disease after they first observed it in their crops. Those techniques (as reported by the survey farmers) have included: the use of pesticides, the use of disease resistant varieties, the removal of infected plants, the changes in the planting time, and other measures (Fig. 2). The use of pesticides remains the most common strategy (47.30% of respondents) since this technique did not require a lot of time and resources. Removing affected plants was the second most common option of the respondents. Even though some farmers perceived that this is a waste of their capital resources, more than 20% of the respondents applied this technique in the belief that the disease can be managed over time, and that they can prevent the spread of the disease to other healthy plants. A small number of farmers also applied other techniques, including the application of more fertilizer to the crop (10.10%), the use of a disease resistant variety (8.80%), the change of planting materials (4.70%), and the change to an earlier harvesting period (4.10%), even though the crops were not fully mature and the yield could be lower when compared to that of mature plants (Fig. 2).

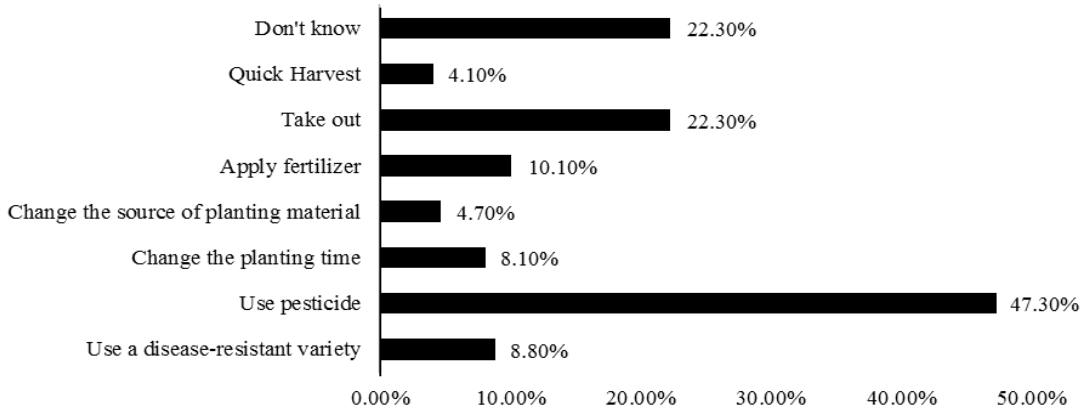

Fig. 2 Farmers' actions after first observed the Cassava Witches' Broom disease on their cassava crop

Key Suggestions from Farmers

From the experience of farmers, CWB is regarded as the most serious yield constraint for their cassava crops, and it ultimately brings harm to their livelihoods. While being in need of assistance to control this disease, the support services for cassava growers in the study areas remain perceived as

insufficient. Even though most farmers have made attempts to manage the disease, their knowledge, capacity, and accessibility to the right products and services remains limited, and thus their control initiatives have generally not been effective. To overcome the constraints, farmers have suggested that stakeholders, especially the agricultural extension service of the Ministry of Agriculture, Forestry and Fisheries (MAFF), provide more practical training on CWB control (72.50%), training on CWB symptoms identification (56.49%), training on effective pesticide application (54.40%), and effective fertilizer application (10.10%). Cassava growers also indicated that they wish to see immediate interventions from MAFF and from local authorities, in the event of any outbreak of disease, and in relation to other issues that they feel the need of urgent assistance (Fig. 3).

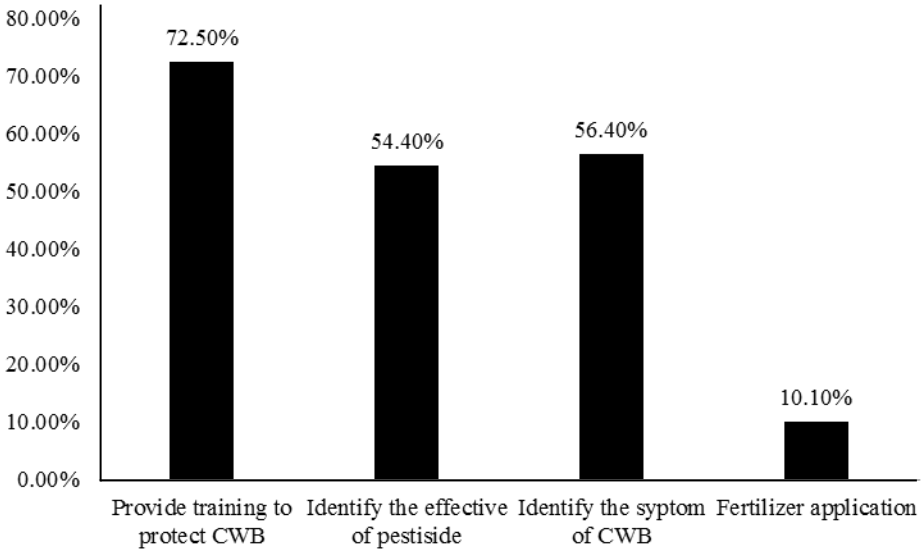

Fig. 3 Key suggestions from farmer survey respondents

CONCLUSION

While more cassava is cultivated by Cambodian farmers due to certain selected preferences, the growth of this crop can potentially be severely affected by Cassava Witches' Broom disease, which can lead to severe crop losses and the downgrading of the quality of cassava roots and starch content. From the survey on the causes and effects of CWB on cassava production in the survey area, the following conclusions can be drawn:

Cambodian farmers still do not have a lot of experience in growing cassava, particularly in large scale production. In general, farmers still do not have the accessibility to quality cassava planting materials from within the country. At the same time, the improper application of pesticide does not enable farmers to effectively control the pest factors on their cassava. They often had limited capacity to address significant issues, such as the problems particularly caused by CWB. A lack of access to local agricultural extension services has also resulted in cassava growers facing difficulties in relation to getting advice on management and production issues.

The issue of reducing the future ongoing impact of CWB is critical, as most cassava growers are still committed to growing this crop in the future. This requires an improved management practice as well as a timely support to farmers in need. Thus, this also highlights the importance of agricultural extension services in providing guidance to cassava growers for the management of their cassava crops. To mitigate the consequences of using chemical pesticides, the introduction of the CWB resistant

cassava varieties is the best option for the future and this could motivate farmers to continue growing this crop in a more secured environment.

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