



Farmer knowledge and perception of production constraints in Northwest Cambodia



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ABSTRACT

Upland farming in Northwest Cambodia has developed rapidly over the last 20 years, with limitations to the plough based system now apparent, including soil degradation and reductions in yield and profitability. A survey was conducted in order to prioritise the main constraints to production, to aid in future research planning, and to identify potential beneficial modifications to the current system. Three hundred and ninety one farmers were interviewed regarding their current farming system constraints, knowledge of conservation agriculture and their future plans in the Districts of Samlout in Battambang Province and Sala Krau in Pailin Province. Perceived major problems in the farming system were extreme climate events such as droughts and heavy rain, declining crop yields, and cash flow shortages, particularly in the pre-monsoon period. This is a plough based farming system, yet 66% of farmers had heard of conservation agriculture, and 59% wanted to learn more about conservation agriculture practices. Two thirds of farmers were interested in how to grow crops in the post-monsoon dry season on residual soil moisture. The survey highlighted opportunities for farmer education and adoption of farming system modifications to improve productivity and sustainability of the farming system in Northwest Cambodia, and assist with climate change adaptation.

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1. Introduction

Farming of upland areas in the Provinces of Battambang and Pailin is relatively new compared to lowland areas of cultivation in Cambodia which have a long history of rice-based farming systems (Mak, 2001; Nesbitt, 1997). Upland cropping has expanded from virtually no production before 1998 to approximately 220,000 ha in Battambang Province (Martin et al., 2016) and 32,000 ha in Pailin Province in 2009 (Provincial Department of Agriculture, 2016). Prior to 1998 the target regions for this study, Samlout District in Battambang Province and Sala Krau District in Pailin Province, were Khmer Rouge stronghold zones during the protracted civil war (Vannath, 2002). The landscape consisted of dense tropical rainforest which has been progressively cleared over the last 20 years (Bognar, 2015). A side effect of the war is that much of the population are displaced persons (National Institute of Statistics, 1999),

with no knowledge of upland farming systems. Their livelihoods, nutrition, health and education, all suffer in this remote region due to lack of infrastructure and access to essential services (Touk, 2004). Furthermore, despite ongoing mine clearance, this region is the most heavily landmined area remaining in the country and Cambodia has the highest global rate per capita of amputees, with many farmers suffering permanent disabilities at the expense of land clearing (The HALO Trust, 2016).

Soil erosion and land degradation are evident due to cultivation of sloping land subject to intense tropical rainfall. Farmer's crop yields and profitability are declining, and crop diversity within the farming system is diminishing (Belfield et al., 2013), yet this area has the potential to be a highly productive contributor to upland agriculture and food security (Belfield et al., 2011). The region is of particular significance to the wider catchment area as it contains the headwaters of the Sangke River, which is the main river system that supplies drinking and sanitation water for over one million people living in the Northwest Provinces of Battambang and Pailin (Bognar, 2015). Irrigation and fishing industries are also reliant on this water source (Bognar, 2015). Information provided from an extensive survey of local farmers would assist in the understanding

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of the complexities of their farming system as well as setting research priorities. The potential to halt further land degradation in this important upper catchment, in a relatively short timeframe since the development of agricultural systems in the region, would have local and far reaching benefits.

The friable free-draining soils and undulating topography of this region suit the conservation agriculture practice of no-till farming (Chan et al., 2009). Conservation agriculture is a method of farming whereby the soil is not ploughed and minimal soil disturbance occurs from farming operations (Kassam et al., 2009). Crop residues are retained *in situ* above and below ground to be recycled as organic matter and nutrients (Kassam et al., 2009). Crop diversity is important in this system, with crop sequences including legumes or alternative crop species encouraged (Kassam et al., 2009; Pretty and Bharucha, 2014). However, the current farming system in this region is a tractor-based system where farmers disc plough, usually twice, before sowing (Brown and Johnstone, 2012; Chan et al., 2009; Martin and Belfield, 2007). Burning of crop residues is prevalent in the post-monsoon dry season (Chan et al., 2009), and in recent years nutritional deficiencies can be visually observed in maize fields throughout the growing season (Belfield et al., 2013). Farmers receive most of their training from NGO's not Government extension staff, and rely on their own knowledge and discussions with neighbours when making crop input decisions (Martin et al., 2013). There appears to be much scope for adoption of new practices and farmer training through dissemination methods such as Farmer Field Schools (Pender, 2007) and field days, with farmers identifying the need for training on soil management, crop production and crop rotations (Martin et al., 2013). Previous research in the region had identified that the current farming system was not economically or environmentally sound (Belfield et al., 2013; Brown and Johnstone, 2012). Our aim for the region was to find possible solutions to help rectify and reduce the environmental degradation, through methods that would also enhance farmer livelihoods. We conducted an extensive survey of farmers in the study regions of Samlout District, Battambang Province and Sala Krau District, Pailin Province. The aim was to gather information about current farming practices, constraints to production, farmer's ideas for the future of the production system and their attitude towards conservation agriculture and alternative crop planting windows. This information assisted in setting research priorities for on-farm experimentation and extension.

2. Methodology

2.1. The survey process

A face to face survey of 391 farm families was conducted in the Districts of Samlout in Battambang Province and Sala Krau in Pailin Province (Fig. 1). The majority of survey questions were either mutually exclusive or collectively exhaustive (Davies, 2012) to reduce ambiguity of the dataset, however in some instances it was necessary to formulate open-ended questions.

2.2. Planning and preparation stage

Within each District, three Communes were selected to take part in the survey, based on local statistics of household maize production. The Commune Database (CDB)-Online database was used to ID communes and villages that focussed on upland crop and also kept cows (National Committee for Sub-National Democratic Development, 2012). Three to five Villages per Commune were targeted for interview, as determined by the Commune Chief in consultation with Non-Governmental Organisation (NGO) staff from Maddox Jolie-Pitt Foundation (MJP). The Communes selected

in Samlout District were Samlout, Sung and Meanchey, and in Sala Krau District, Sala Krau, Steung Kach and Ou Andong were selected. Prior to conducting the survey, the formal process of seeking written permission and meeting with the Village Chief of each target village occurred. We explained the survey and its objectives and asked permission to interview a representative from each of 15 farming families per village. A gender preference was not specified as the representative spoke on behalf of the whole farm family.

2.3. Conducting the survey

Twenty seven volunteer students from the University of Battambang were trained in survey interview techniques and briefed on the survey questions. They then undertook a full day pilot session in the field to assess the understanding and competency of the interviewer, the fluidity of survey questions and the time taken per interview. Project staff assisted and mentored the students, who operated in two groups to conduct the interviews over a two week period. Due to extended travel time to remote areas, only two villages per day were interviewed by each group, which in total equalled 391 respondents. Overall, 29 villages were involved in the survey, with 15 villages from Sala Krau District, Pailin Province and 14 villages from Samlout District, Battambang Province. Each session commenced with an informal greeting and information about the objectives of the survey. The interview consisted of one interviewer and one respondent and took 60–90 min to complete. Ethics approval to conduct research involving human participants was received by the Human Research Ethics Committee at the University of New England (UNE, approval number HE13-159).

2.4. Data entry and summation

The surveys were conducted in Khmer and the results translated to English by the data entry team, prior to entry into the database. Data were summarised into tables or figures of means, proportions, ranges and frequencies, via Excel (2013). Results are based on six main categories which include a general household profile, crop calendar and yields, constraints to production, crop residue management, crop nutrition and post-monsoon cropping. Supplementary material related to the survey questions is contained in [appendix A](#).

2.5. Household profiles

Data contained in this section were derived through a series of questions to gain basic demographic information about the survey participants, including the number of households that are headed by males, farm size, proportion of upland cropping, and farm landmine status. Questions related to gender and demining of land were mutually exclusive, whereas responses related to farm size and cropping area were derived from open ended questions. Competing land uses were not assessed in this survey, as local knowledge from NGO staff, Commune Chiefs and provincial government documents concurred that this was not an issue in our survey areas (Nuon, S. pers comm.). Questions relating to land tenure were omitted from this survey as it is a contentious subject in the region which would require stand alone interviews due to the complex framework and history.

2.6. Crop calendar and yields

Respondents were asked to list all the crop types they had grown over the five year period from 2008 to 2012, and mark the months during which each crop was grown. A crop calendar was constructed from the count data of the months in which farmers

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