Research article

Farm Machineries and Equipment Needs Assessment of the Corn Block Farming in Dagohoy, Bohol, Central Philippines: Basis for Financial and Support Services

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Abstract To increase production, land productivity, and farming efficiency in the corn-producing municipality of Dagohoy, Bohol, Central Philippines, the Candelaria Multi-Purpose Cooperative of the locality in collaboration with the Department of Agrarian Reform have proposed corn block farming involving the Agrarian Reform Beneficiaries (ARB's) from two Agrarian Reform Communities (ARC's) in the area. Funding agency of the proposed project required the needed number and type of machinery and equipment for a productive and profitable corn block farming in Dagohoy, Bohol ARCs. Thus, an in depth assessment on the farm machineries and equipment needs of corn block farming in the area was done based on the characterization of its natural and physical resources, as well as the size of the potential area for corn block farming. A set of participatory rural appraisal techniques were adopted in the assessment process. After the thorough analysis of the data collected, corn block farming was found to be suitable in the proposed project site considering soil types, climatic condition, availability of water, infrastructures, and other required facilities. The project site had 724 potential hectares for corn production. However, full mechanization was not possible due to existing moderate slopes (8-18% slope) in some areas. Traditional farming methods at production stage could be integrated considering that some of the fields do not favor full mechanization and the farming methods could also provide employment for the displaced labor in some farm operations. Due to high investment requirement, pilot production among others could be started in a 30-40 hectare portion to be managed by the Candelaria Multi-Purpose Cooperative.

Keywords corn block farming, needs assessment, Agrarian Reform Communities (ARCs), common service facilities, corn machineries

INTRODUCTION

Agriculture provides food and livelihood to the people. This sector represents 1/5 of the total economy and generates 1/3 of the Philippines total employment (Philippine Climate Change Commission, 2010). This great contribution to the national economy communicates the government to provide the needs and addresses the identified gaps for continuous and more contributions. Because the poverty incidence in Bohol, Philippines was significantly reduced in 2012 after achieving 100% rice self-sufficiency level including some other commodities, (PGBh ELA, 2011-2013), the provincial government is thrusting to increase agricultural production for food security and economic stability in the island. The government is interested on mechanized farming for timely production and postharvest operations to increase yield with better quality products. Hence, to minimize production cost while maximizing efficiency of farm machineries and equipment, block farming is introduced through the support of the Department of

Agrarian Reform (DAR) Program. In Bohol, corn block farming is proposed by Candelaria Multi-purpose Cooperative (Candelaria MPC) in the municipality of Dagohoy to maximize the utilization of the 380 hectares out of its aggregate land area of 2,302 hectares. To attain a timely production, however, financial assistance, associated farm machineries and technical support services are highly needed.

Based on the Sugarcane Industry Development Act of 2014 of the country, infrastructure, funding for farm mechanization and modernization, capability trainings, and other support services are provided for block farming. Musaba et al. (2014) also affirms that focusing access on better production inputs will improve farm efficiency. Moreover, Asadullah et al. (2005) states that household/farmers' education significantly reduces farm production inefficiencies, thereby, increasing productivity. Accordingly, providing the needed input supports associated with the adoption of block farming practice may ensure farm efficiency and productivity. To realize, and for the efficient implementation of the corn block farming project in Bohol, the Candelaria cooperative needs the information on the: number, kind/type, and specifications of the machineries and equipment which are to be used in this important block farming venture. This study was conducted as commissioned by DAR.

OBJECTIVES

This study was conducted to assess the farm machineries and equipment needs of Candelaria Multi-purpose Cooperative for corn block farming in a 380-hectare area in Dagohoy, Bohol, Philippines. The objectives were specifically aimed to characterize the natural and physical resources of the community for suitability to corn production; to determine the size of the potential area for corn block farming; to describe the corn production and postharvest practices of the farmers; and to identify the existing farm machineries and tools of the farmers and those needed in the operation of the corn block farming in the ARCs.

METHODOLOGY

Pre-assessment activities were done through a series of consultations with the Municipal Agrarian Reform Officer (MARO) and Chairman of the Cooperative, preparation, and revision of data collection materials, as well as the orientation of the Research Team on the mechanics of the study. The needs assessment used a set of tools from the participatory appraisal approach. The techniques and the data sources were triangulated. The employed techniques were the collection and analysis of secondary data from the DARPO, MARO, and the Cooperative; the semi-structured survey questionnaire-aided interview answered by the officials and members of the cooperative as well as barangay officials. In addition, a focus group discussion for a group interaction was conducted to obtain detailed information on particular issues, gaps and problems regarding their needs for farm machineries for their corn block farming enterprise, which was led by the cooperative. Descriptive and quantitative data analysis was adopted to obtain the needed information from the different tools used.

RESULTS AND DISCUSSION

Soil suitability of the area to corn block farming: The edaphic condition of the ARCs in Dagohoy is dominated by two soil types namely: Ubay clay and Ubay clay loam. Ubay clay covers 8,266 hectares (66.16% found in the central part of the municipality) and Ubay clay loam in the northern and eastern sides, with the remaining 4,229 hectares (33.84%) of the total land area, including the south-western border of the municipality. The 380 hectare-corn block farm of Candelaria ARC is located at the central to the south-western border, (Figs. 1 and 2). These types of soil are suitable to all kinds of crops including corn (DARPO, 2003). The most desirable soil for corn production is deep, medium textured,

well drained, and with high organic matter and water holding capacity. Soil types with these characteristics are loam, silt loam, and silty clay loam (PCARRD,1981). Hence, the soil conditions in the ARC are very suitable for corn production but thorough land preparation remains a requirement, which is the reason for the need of efficient farm implements and machineries.

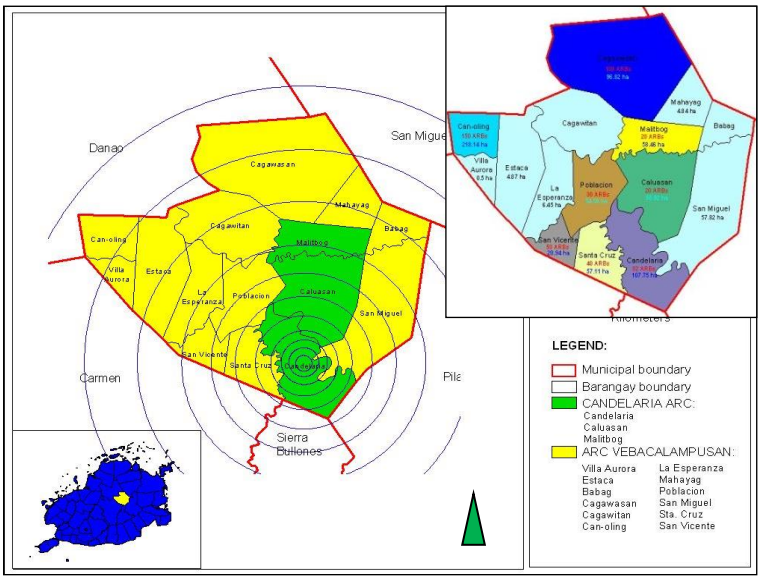

Fig. 1 Connectivity map showing the ARC's and ARB's corn areas by barangay

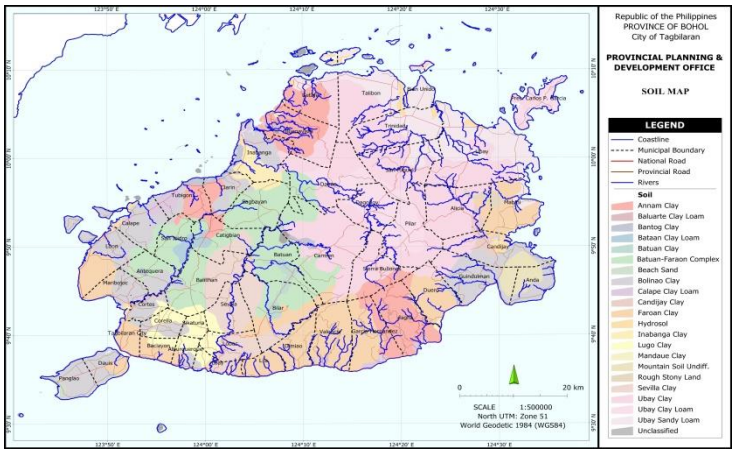

Fig. 2 Soil Map of Bohol showing the Ubay Clay and Ubay Clay Loam soil of the Municipality of Dagohoy, Bohol

Climatic suitability: Most of the country's corn-producing areas are rainfed. A good cropping of corn is highly dependent on sustained rainfall, especially during the critical stages of the crop development (Reyes et al., 2009). It also requires fair soil moisture and warm climate. The municipality of Dagohoy is classified as under Type IV climatic condition, characterized by more or less stable distribution of rainfall throughout the year with moderate rainy season (kidlat.pagasa.dost.gov.ph). The average temperature is 28.6^{0}C with the coldest months having average temperature of 24.4^{0}C from November to January. The relative humidity is more or less uniformed throughout the year. The area is rarely hit by a typhoon and has high precipitation from July to November (DARPO, 2014). Hence, farmers commonly plant corn in May for the first cropping and the second cropping in September.

Water resources: Groundwater is the main source of potable water in the municipality. There are 3 water supplies: Level 1 comprising of 618 water wells; Level 2 including communal piped water system; and Level 3 serving for the water system reaching respective households. There are several springs and small creeks in Barangay Caluasan and Candelaria apart from the three rivers, namely Wahig-Pamacsalan River, Malitbog River, and Hamoog River, which are considered potential sources for irrigation water (DARPO, 2004). It is believed that these resources can already support corn crops as the plant requires 4 to 5 mm of water per day. During critical periods like silking and soft dough stages, the requirement could be as much as 6 to 8 mm/day. It is estimated that the most critical point falls around 55 days after planting (Lansigan, 2004). Literatures have stated that water should be available at 40 DAP during the start of flowering and reproductive stages (Reyes et al., 2009).

Slope: Most of the agricultural lands, 30-75% of the total land area, in the ARCs of Dagohoy are from flat to undulating 0-15% slope (DARPO-DARMO, 2013). The topography of ARC Candelaria ranges from level to rolling where 1,286 hectares have 0-3% or level to nearly level; 790 hectares have 3-8% or gently sloping to undulating; 226 hectares with 8-18% or moderately sloping to rolling. These ranges of slope are suitable for upland crops like corn (DARPO, 2004).

Potential production area: Barangay Candelaria, Caluasan, and Malitbog of Dagohoy have an aggregate area of 2,302 hectares of land in which 1,889 hectares (82%) is agricultural lands including 365 hectares for cornfields (DARPO, 2014). The 2013 survey found that all of the respondent-ARBs had a total land area of 107 hectares with 38 hectares planted with corn (Fig. 2). The respondents were only 10% of the total number of ARBs in the community. Correspondingly, the data imply that the current cornfield utilization is almost similar to the one in the year 2004 with a derived value of about 380 hectares. Thus, the expected total area covering the project is 380 hectares. Data from the MARO and CMPC show that Dagohoy has a total potential area of 724 hectares planted with corn by 34.25% (512hectares) of the ARBs. Some of the corn fields are owned by non-ARBs. There are also areas in the ARCs that have been previously planted with cassava potentially turning to corn fields.

Average yield: Survey results of DAPRO (2013) show that the average yield of the corn fields at the ARCs is 2.89 metric tons(Mt)/ha with an average production of 2.66 Mt per cropping costing an average of ₱5,000.00 per unit area. This production rate conforms with the average national production rate of 2.83 Mt/ha (DARPO, 2004). The production cost is observed to be ₱6,000/ha providing an average income to the farmer-respondents of ₱38,000 per hectare per cropping.

Market: Corn farming in the ARCs in Dagohoy can be classified as subsistence and market driven. Seventy percent of the respondents who own only 0.60-1.00 ha corn area belong to the subsistence group, as their production is intended for food security of household. Being influenced by marketing campaigns and given supports, other corn growers evolve themselves by adopting high-yielding hybrid corn technology. The market of their hybrid corn products owns a feed mill and operates a commercial scale hog and poultry farms (DARPO, 2013). This market driven corn farming has assured an immediate market of its products.

Rural infrastructures: All barangays are accessible through the road networks constructed out of gravel and limestone with about 17.0 km stretch within the ARCs. Few areas are not passable during heavy rainy season due to sticky/muddy/slippery situations. The Pilar Irrigation System of the National Irrigation Administration is functional and serving 440 hectares of agricultural areas in the municipality. Gridlines for electrical source are also available to the majority of the areas. This facility is needed in any electrically-powered stationary corn processing machineries and equipment. Means of communications are also available to facilitate delivery of information to any farmer-officials and members (DARPO, 2004 and DARPO, 2013).

Production and postharvest practices of the corn farmers: The subsistence corn farmers in the ARC employ farming methods for both production and post production operations in the same way as

the market-driven producers. There are a number of processes during production operations. Farmers select seeds of their preferred improved varieties; hybrid; do thorough land preparation with 2-3 plowings and furrowing using carabao-drawn plow; manual planting; use commercial complete fertilizers or do not apply any kind of fertilizer; conduct off-baring and hilling-up at knee-high stage; perform weeding, bolo and scythe are used in traditional hand weeding; and sometimes spray chemical pesticides for pest and disease management. Post-production activities include manual harvesting and dehusking; shelling used dull bolo or shredder; while wooden-toothed sheller or motor-driven corn shellers in shelling kernels for seeds. Sun drying in buri mats, tarpaulin, nets or drying pavement are very common but the cooperative has mechanical drying services. Farmers deliver small volume of corn grains in wooden sled or motorcycle-service to buyers in the local; but corn ears in bulk are picked-up by private feed mill operators.

Existing farm tools, equipment and machineries: The total farming households in the ARC own 621 draft animals and a total of 822 moldboard plow for land preparation (DARPO, 2004).

Table 1 The quantity, type of machineries, equipment, its specifications needed in the corn block farms in Dagohoy, Bohol with an area of 380 hectares based on the assumptions

Quantity	Image	Technical Specifications
5 units		Front Wheel Assist (FWA), Four-wheel tractor-diesel engine, Drawbar-96Hp (min), 172 Hp (min) PTO (includes with 6-60ϕ disk plow implement and an offset harrow)
5 units		Model 2BYF-3, Tractor-drawn, 3-row corn planter/seeder with fertilizer applicator CTN Size: 1700x1620x1100 mm
1 unit	No image	Self-propelled corn seeder/planter with fertilizer applicator, 3 ha field capacity daily
13 units		Self-propelled harvester, Model 4YW-2C, 20HP, with storage tank vol (1cu.m) CTN Size: 3200X1300x2800

The study found that the cooperative has a multipurpose drying pavement and a mechanical dryer (DA-distributed flatbed) with a shed commonly utilized in drying rice, and corn ears/grains during inclement weather; farmers have traditional farming tools and equipment such as moldboard plow, sharp/dull bolo, scythe (long), wooden sled, home-made shredder, home-made wooden-toothed sheller for corn grain production and buri mat. Tarpaulins were used by the majority of the farmers in corn production and post-production.

Machineries and equipment needs and assumptions: Corn production cycle analysis was used to determine the machinery and equipment needs of the farmers for corn block farming. The analysis considered the current production area of 380 hectares, existing production, and post-production practices of the corn farmers in Dagohoy, Bohol. Some assumptions were made as follows:corn production is fully-mechanized; land preparation will be done using 4-wheeled tractor travelling at 8 kph having 6-60 cm disk plow with offset, and effective width of 1.8-2.0 m.; land preparation will be done for 30 days which includes one plowing and two harrowing operations; post-production operations (harvesting to shelling) will be done for 15 days; tractors will be used for seeding/planting

and fertilizer applications; self-propelled corn planter has fertilizer application function; and self-propelled corn harvester has a capacity of 1.0 ha a day.

CONCLUSION

Considering the overall requirements of corn crop, the agricultural uplands of the municipality of Dagohoy are very suitable for corn production in terms of soil types, availability of water source subsuming well-distributed rainfall during the year, and the weather condition which favors for its growth and development. In a view of the field conditions, due to existing moderate slopes (8-18%) in some areas of the Municipality of Dagohoy, Bohol, only partial mechanization is possible. Engaging into corn block farming, the Candilaria Multipurpose Cooperative needs a big investment based on the identified machineries, equipment, technical support services, and skilled manpower required for efficient and timely operation of the planned agri-enterprise.

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