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Analysis of competency among women in irrigation farming in the North West province, South Africa: A Borich needs model approach

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Abstract

The study determined the competence needs of women farmers in irrigation farming through the application of the Borich needs assessment model. A simple random sampling technique was used to select 83 respondents using a structured face validated questionnaire containing the list of 23 farming activities developed from the operations and activities on the existing field. The farming activities were divided into three categories, namely, Pre- and Post-Planting, Irrigation, and Marketing. Competency needs were analysed and ranked using mean weighed discrepancy score. The results indicated low levels of competence in all 23 tasks which implied that there is a need for prioritized training for women in irrigation farming in the study area. The provincial department of agriculture can use these findings as a basis of training programmes for women involved in irrigation farming.

Key words: Borich needs model, competence, farming tasks, irrigation farming.

Introduction

According to van Averbeke, Denison, and Mnkeni (2011), smallholder irrigation schemes are of secondary importance in terms of land area and farmers' contribution. The importance of smallholder schemes arises primarily from their location in homelands, which continues to be poverty nodes (Sanewe, Roux, Jewitt, & Kunz, 2014). Irrigated farming in such areas can contribute positively to food security and in the income of participating homesteads (Bembridge, 2000).

According to the FAO (2011), in developing countries, there are about 43% of women working in agriculture. Women in irrigation farming face more challenges than men. As stated by Food and Agriculture Organization (2011), women do not have access to resources and opportunities for production like men. Most female farmers involved in irrigation farming are faced with serious challenges, including skills development, poor access to credit, poor access to other inputs such as fertilizers, and poor access to facilities such as storage and transportation. Although many resources such as technology, skills transfer, and practice are currently used in many countries of Africa, poor knowledge of sustainable agricultural techniques is a major limiting factor, especially for women involved in irrigation farming in agriculture. Insufficient information towards farmers in irrigation and the necessary skills to manage the diversity of the irrigation farming systems could be a major barrier towards the adoption of technology in farming (Pretty & Ward, 2001).

The South African government is making efforts to give women in irrigation farming access to improve their living standards, by providing facilities that will be used to meet their needs. However, farmers still require training to use such resources effectively as well as test their level of competency with these facilities. The use of irrigation requires training to explore livelihood options. Lack of training and skill development of women involved in irrigation and farming, in general, is one of the major reasons why irrigation farming potential has not been maximized. The objective of this study is to analyse the competency among women in irrigation farming in the North West province using a Borich needs model.

Literature review on competence in agriculture

The term competence is regarded as "the adequacy of knowledge and skills that permit a person to perform in a wide variety of circumstances". It is, therefore, the ability to do proficiently and excellently to be successful (Umar, Man, Nawi, Latif, & Samah, 2017). Furthermore, it was highlighted that competencies involve clusters of abilities, expertise, skills, and behaviours needed to succeed. The notion

of competence as combined skills is becoming increasingly common (Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004). Mulder (2001) and Kibwika, Wals, and Nassuna-Musoke (2009) describe competence as skills, abilities, or potential and can be interpreted as characteristics of individuals, teams, work units, or organizations that allow them to achieve the desired accomplishments. According to Movahedi and Nagel (2012), competence is a diverse set of attributes (knowledge, power, ability) to be combined, organized, and incorporated so that the activities that constitute the professional operation of farming can be effectively undertaken by farm owners and staff.

Material and Methods

The study was carried out in the North West Province, South Africa. The study population included all women involved in irrigation farming which is 120 in the province. A simple random sampling technique was used to select a sample of 83 farmers to obtain a representative sample. A structured questionnaire consisting of farmer's characteristics and 23 farming tasks was administered. Competence and importance of the 23 identified tasks were measured on a 3-point Likert-type scale of low (1), moderate (2), and high (3). The questionnaire was face validated by a panel of agricultural extension experts and researchers. The reliability coefficient for the questionnaire was r^2 0.85. Data were analysed using the IBM statistical package for social sciences version 21. Descriptive statistics such as mean and standard deviation were also employed. A mean weighted discrepancy score (MWDS) was used to calculate and describe the overall rankings for each of the competencies. To determine the MWDS, a discrepancy score (DS) was calculated for each individual on each competency by taking the importance rating minus the ability (competency) rating; a weighted discrepancy score (WDS) was calculated for each individual, for each of the competencies by multiplying the discrepancy score by the mean importance rating; and an MWDS for each of the competencies was calculated by taking the sum of the weighted discrepancy scores and dividing it by the number of observations.

$$MWDS = \sum \left[\left(I_{ith} - C_{ith} \right) \times \bar{x} I / N \right] \qquad ....(1)$$

I = importance rating for each task, C = competency rating for each task, $\bar{x}$ = mean of importance rating, N = number of observations

Using the MWDS, the 23 competency statements derived from the operations and activities carried on in the field were ranked following (Borich,

1980; Elhamoly, Koledoye & Kamel, 2014; Oladele, 2015). Competency models, such as the Borich's needs assessment, are designed around the skills of individuals or groups that need to be effective in the future and used for making verdicts relating to human resources. In this case, the model attempts to determine the congruence between what women in irrigation should be able to do and what they can do. Many studies have been presented to determine training needs in the agricultural sector, both in formal (Peake, Duncan & Ricketts, 2007) and informal settings (Gregg & Irani, 2004). According to Borich (1980), using the MWDS, the importance of rating for each task is represented by competency rating for each task (C), the importance ($\bar{x}$I), and the number of observations (N).

Results and Discussion

Competence on irrigation farming tasks among women involved in irrigation schemes

A mean score above 2 signifies competence while a mean score of less than 2 signifies low competence of the identified tasks. Pre- and post-planting tasks - table (1) shows the results of the range of competence from highest to lowest among women category concerning pre and post planting tasks. The results revealed that all 10 tasks had a mean score of less than 2, indicating that the respondent is not competent in pre and post-planting tasks identified. Even though all competencies were below cut off point 2, soil preparation for ploughing ($\bar{x}$ = 1.63, SD = 0.58) and appropriate application of herbicides and fungicides ($\bar{x}$ = 1.63, SD = 0.56) received the highest ranking while, calibrating planters and seeders for various crops ($\bar{x}$ = 1.39, SD = 0.51), planning and carrying out harvesting appropriately for various crops ($\bar{x}$ = 1.40, SD = 0.54); knowledge of crop rotation ($\bar{x}$ = 1.45, SD = 0.57) was ranked amongst the lowest competencies. The result is in compliance with Tshwene (2019) in Kwazulu-Natal that female farmers were not competent in herbicides and fungicides application, planting especially crop rotation and various harvesting techniques.

Irrigation management tasks - the perceived level of competence of women on irrigation management, the result revealed that of the 4 tasks, none of them was above the cut-off point of 2; this indicated that the competency level under irrigation management is very low. The tasks with the lowest competence mean score were knowledge on the amount of water to use ($\bar{x}$ = 1.33, SD = 0.52), followed by evaluating farming land for soil and water conservation ($\bar{x}$ = 1.45, SD = 0.55) and recommendation of suitable profile and water conservation measures for specific farmland ($\bar{x}$ = 1.46, SD = 0.57). The results comply with Botlhoko (2012) that women farmers in irrigation schemes of the North West

province are incompetent in water management skills, e.g., determining water requirements for crops, proper timing of irrigation application, and irrigation scheduling.

Marketing tasks - the results further indicated that respondents had a mean score that was below the cut-off point of 2 indicating that in all the nine farming tasks identified, they were incompetent. The tasks with the lowest competence mean score were knowledge of reading and interpreting marketing information ($\bar{x}$ = 1.19, SD = 0.40), value-adding ($\bar{x}$ = 1.23, SD = 0.45), price determination for produce ($\bar{x}$ = 1.25, SD = 0.49) and knowledge of marketing contracts ($\bar{x}$ = 1.37, SD = 0.59). Tekana (2014) revealed that women were incompetent in marketing skills.

Women farmers perceived level of importance on irrigation farming tasks

Importance of pre- and post-planting tasks - Table 1 shows the rating of the importance of the task on a 3-point Likert-type scale of low (1), moderate (2), and high (3). The most important tasks, as ranked by the respondents under pre- and post-planting were an appropriate application of herbicides and fungicides ($\bar{x}$ = 2.63, SD = 0.57), knowledge of crop rotation ($\bar{x}$ = 2.61, SD = 0.59), calculating the amount of fertilizer to apply for various crops ($\bar{x}$ = 2.60, SD = 0.57), calibrating planters and seeders for various crops ($\bar{x}$ = 2.55, SD = 0.56) and evaluating soil profile in farming ($\bar{x}$ = 2.54, SD = 0.54). The result agrees with Raidimi (2014) that women are responsible for determining the quantity and quality of food available and also determines what amount gets to the table. Food and Agriculture Organization (2011) also agrees that most of the pre and post-planting activities in farming are carried out by women because they participate in production, harvesting, marketing and storage.

Importance of irrigation management tasks - Table 1 further shows the identified tasks under irrigation management. The results revealed a high importance of all the attached tasks as they are all above cut-off point 2. The most important tasks, as ranked by the respondents were, knowledge on the amount of water to use ($\bar{x}$ = 2.66, SD = 0.52), evaluating farming land for soil and water conservation ($\bar{x}$ = 2.54, SD = 0.55), recommending suitable profile and water conservation measures for specific farmland ($\bar{x}$ = 2.37, SD = 0.57), and irrigation scheduling and frequency ($\bar{x}$ = 2.30, SD = 0.62). According to Tekana and Oladele (2011), training in irrigation and water management is vital as it improves knowledge of water management boosting farm productivity in the irrigation schemes.

Importance of marketing tasks - the most important tasks, as ranked by the respondents were knowledge of reading and interpreting marketing

information ($\bar{x}$ = 2.81, SD = 0.40), value-adding ($\bar{x}$ = 2.77, SD = 0.59), price determination for your produce ($\bar{x}$ = 2.75, SD = 0.49), and knowledge of marketing contracts ($\bar{x}$ = 2.63, SD = 0.59).

Training needs among women in irrigation farming

The 23 competencies were then ranked according to the pre- and post-planting (10), irrigation management (4), and marketing (9). Table (1) shows the results of the competence needs of women in irrigation. According to Oladele (2015), the higher the MWDS the greater the competence needed for the assigned task. From the ten competencies under pre and post planting, only two were set to be positive with the greatest needs, which are soil preparation for ploughing (MWDS = 0.91) and planning and carrying out harvesting appropriately for various crops (MWDS = 0.11).

The results agree with Tshwene *et al*. (2019) that women in Assam are involved in activities such as land preparation, application of fertilizers, and plant protection against pest and diseases, further adding that such activities are difficult and, therefore, necessitates training and skills development. The result further revealed that the competency need under irrigation and management was only for recommendation of suitable profile and water conservation measures for specific farmland (MWDS= 0.19) with the other three competencies being negative. The results are in accordance with Alarima *et al*. (2011), who indicated that farmers revealed that training needs in water management are highly required. This implies that there is a need for women farmers to be acquitted with training on water management in irrigation schemes. Positive MWDS were obtained for all competencies under marketing.

The competency with the greatest need for marketing as perceived by the respondents was knowledge of reading and interpreting marketing information (MWDS = 0.56), price determination for your produce (MWDS = 0.29), and knowledge of marketing contracts (MWDS=0.24). The result indicates that there is a need for training in all marketing competencies even though Tekana and Oladele (2011) indicated that farmers in Taung irrigation scheme reported that they have received training in record keeping and financial management, but that has not improved their level of competency in financial management and other marketing competencies. The results revealed poor knowledge in all listed competencies. The implication of the results indicated that there is a need for training in all 23 identified competencies.

Tab. 1. Competence and skills in irrigation farming tasks among women involved in irrigation farming

	Competence		Importance		Training needs	
Pre- and post-planting	M	SD	M	SD	MWDS	Rank
Soil preparation for ploughing	1.63	0.58	2.39	0.59	0.91	1
Determining inter and intra row spacing	1.61	0.60	2.39	0.61	-0.04	3
Determining seed depth	1.58	0.59	2.42	0.59	-0.09	4
Selecting appropriate planting methods for various crops	1.59	0.61	2.41	0.40	-0.47	10
Evaluating soil profile in farming	1.52	0.59	2.61	0.45	-0.36	9
Knowledge of crop rotation	1.45	0.57	2.60	0.59	-0.18	6
Calculating the amount of fertilizer to apply for various crop	1.63	0.57	2.63	0.59	-0.10	5
Appropriate application of herbicides and fungicides	1.63	0.56	2.55	0.59	-0.23	7
Calibrating planters and seeders for various crops	1.39	0.51	2.39	0.55	0.11	2
Planning and carrying out harvesting appropriately for various crops	1.40	0.54	2.54	0.58	-0.24	8
Irrigation management						
Evaluating farming land for soil and water conservation	1.45	0.55	2.54	0.59	-0.10	3
Recommending suitable profiles and water conservation measures for specific farmland	1.46	0.57	2.37	0.59	0.19	1
Irrigation scheduling and frequency	1.71	0.62	2.30	0.55	-0.08	2
Knowledge of the amount of water to use	1.33	0.52	2.66	0.59	-0.35	4
Marketing						
Knowledge of the market for your produce	1.42	0.52	2.58	0.55	0.18	8
Price determination for your produce	1.25	0.49	2.75	0.40	0.29	2
Knowledge of reading and interpreting marketing information	1.19	0.40	2.81	0.45	0.56	1
Knowledge of marketing contracts	1.37	0.59	2.63	0.59	0.24	3
Value-adding to products	1.23	0.45	2.77	0.58	0.14	9
Service provider for storage facilities	1.47	0.59	2.54	0.55	0.23	4
Farm record-keeping	1.48	0.59	2.54	0.55	0.23	4
Financial management	1.47	0.59	2.54	0.55	0.23	4
Packaging	1.47	0.59	2.54	0.55	0.23	4

Conclusion

The study examined the competency needs of women in irrigation farming based on the identified tasks through the application of the Borich model. Respondents did not associate great importance to competence in all tasks that resulted in the low competence status in many of the tasks. The implication of women farmers perceived level of competence and importance in all the tasks is a need for training in the identified areas, and it is also recommended to strengthen and support the farmers through technical and extension service delivery. The study identified that women are incompetent in pre- and post-planting knowledge, water management, and marketing. It is recommended that policymakers should intensify efforts through the extension workers to organise trainings, regular workshops and seminars for women in irrigation farming on pre and post planting techniques. It is evident from the study that the knowledge of management is low among respondents; policymakers are encouraged to visit farmers and teach them how to manage their resources and enterprise. To be able to improve the food insecurity status among irrigation farmers, extension service agents need to teach competency among farmers in terms of their marketing tasks. There is also the need to encourage younger generations to venture into irrigation farming as identified in the study.

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Анализа способности жена у пољопривреди која се наводњава у провинцији Сјеверозапад, Јужна Африка: *Borich* модел потребе

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Сажетак

Истраживањем су утврђене потребе за компетенцијама женских пољопривредника у узгоју уз наводњавање и то примјеном *Borich* модела процјене потреба. За одабир 83 испитаника је кориштена једноставна техника случајног узорковања и то уз помоћ структуираног упитника са провјером особа, који садржи попис од 23 пољопривредне активности развијене из операција и активности у овој области. Пољопривредне активности су подијељене у три категорије, и то: прије и послије садње, наводњавање и маркетинг. Потребне компетенције су анализиране и рангиране уз помоћ средње пондерисане оцјене одступања. Резултати су указали на низак ниво компетенција у свих 23 активности, што указује да постоји потреба за приоритетним оспособљавањем жена у области наводњаване пољопривреде. Покрајински одсјек за пољопривреду може да користи резултате овог истраживања као основу за развој програма обуке жена за узгој са наводњавањем.

Кључне ријечи: *Borich* модел потребе, стручност, пољопривредни задаци, наводњавање