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AGREX'17

Empowering Knowledge to Community

Enhancing Food Security

Universiti Putra Malaysia

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Content

VI. Extended Abstract

Preface

Praise to The Greatest for all the blessing, thus we are able to produce the e-Proceedings of International Conference on Agricultural Extension 2017 (AGREX'17). This e-proceeding is the compilation of papers which have been presented at the AGREX'17 on 14 – 16 February 2017 at Universiti Putra Malaysia.

The objectives of this conference are to bring local and foreign experts to catalyse and to share advanced knowledge in agricultural extension, to enhance efforts on the importance of empowerment among agri – food stakeholders in facing global challenges towards sustainability of food security. Furthermore, this conference also facilitate co-operation among key agri-food stakeholders in the area of agricultural extension and development.

Thanks to all the paper and poster presenters who have contributed their writing to be compiled in this e-proceeding. The words of appreciation and thank you are not enough to give to all the members of society as well. Their hard work to complete this e-proceeding is most valued in the hope it will continue in the future.

Finally, we tried to minimize the inconsistencies and errors as much as possible. However, as is always the case, there are undoubtedly some errors that might have escaped our attention. For these, we seek apologize for any fault and weakness from our part through the conduct of the seminar and for delay of producing this e-proceeding due to unavoidable circumstances. We hope this e-proceeding could be beneficial to those involved in the agriculture industry all around the world.

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Developing Entrepreneurship among Women: Opportunities and Constraints

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Gender issues are of greater concern especially in developing countries due to traditional characteristics of the society. The study was conducted to understand the scope and constraints of women participation in entrepreneurship development. Gender analysis tools were used to analyse the work load of women and also scope to take up new activites by women. Activity analysis conducted in two project villages among two categories of women namely "field going" and "stay at home" type of women revealed that about 30 percent of the time (7 hours out of 24 hours) is devoted to field work and equal percent for rest and sleeping. Remaining 40 percent (10 hours) of the time was spent on family care activities. Women opined that they cannot draw any time from domestic activities and only way is to take off from field activities to initiate any new economic activity. Those women who do not go to field had spent more time for leisure and social activities. Though they wish to derive time for new activity, family ties and cultures limit their participation. Further, analysis of access and control of resources revealed that women had access to most of the field activities such as livestock, agriculture and family income; however they do not have control on them except purchase of grocery items at home. Women entrepreneur had faced more hardships in the beginning especially in mobilizing the capital, convincing the family members and marketing of the products. Successful entrepreneurs have contributed to the family income up to 25 percent and have control on their income. The study concluded that any new interventions should have strategy to bring balance between existing work load as well as new activity to ensure success.

Keywords: gender analysis, women entrepreneur, economic activity

Entrepreneurs play a key role in national economy. Technically, "women entrepreneur" are the women who organize and manage any enterprise, usually with the considerable initiatives and risk. The Government of India (1988) has defined women entrepreneurs based on women participation in equity and employment of a business enterprise. Accordingly, a woman enterprise is defined as an enterprise owned and controlled by a woman having a minimum financial interest of 51 % of the capital and giving at least 51 % of the employment generated in the enterprise to a woman.

Women entrepreneurship represents a vast untapped, resource especially in the developing world. The barriers women face includes credit, training, networks and information as well as legal and policy constrains (Carmel Niethammer, 2013). The topic of women entrepreneurship has largely neglected both in society and in the social science (Brush and Hanrich, 1999, Halmquist and Sundis, 2002). Regardless of gender entrepreneurial activity is

typically higher in low and middle income countries than in high income countries. It is estimated that women owned small and medium sized enterprises (SME) represent 31 to 38 percent (8-10 million) formal SME in emerging market(GPFI 2011). Organization for Economic cooperation and Development show that the birth rates of females owned enterprises are higher than those of male owned ones. Giving women a stake in the national reconstruction process by investing in their economic participation, including entrepreneurship, is crucial for effective and sustainable development of the already fragile economics of conflict affected societies (Carmen Niethammer *et al.*, 2012).

In India, though women have played a key role in the society, their entrepreneurial capability has not been properly tapped due to the lower status of women in the society. It is only the fifth five year plan that has been explicitly recognized their roles with marked shift in the approach from women welfare to women development and empowerment. Several policies and programmes have been implemented for the development of women entrepreneurs which includes Udyogini (1997-98), Mahila Samaj Kosh, Rastriya Mahila Kosh (1993), Trade Related Entrepreneurship Assistance and Development (TREAD), etc.

Though women entrepreneurs in India constitutes 13.7 % (8.05 million out of 58.5 million entrepreneurs), there has been significant growth of women entrepreneurs in India. They provide employment to 13.45 million people. Among various enterprises livestock dominates with 31.6 % and average employment per unit is 1.67 (NSSO, 2016).

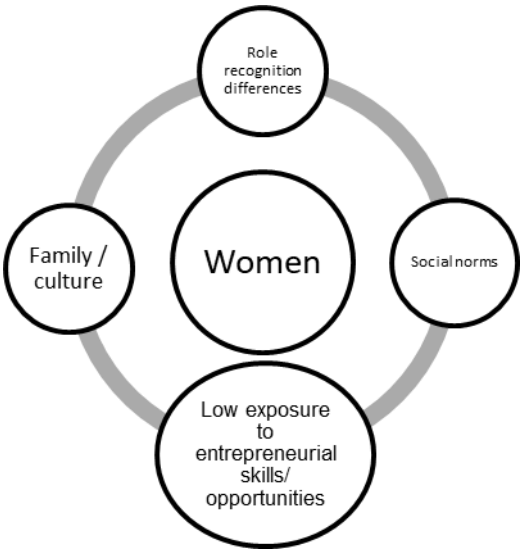


Figure 1: Inhibiting factors of women participation in entrepreneurship development

Many studies reported that women participation in entrepreneurship is restricted due to family culture that advocates men should work and women to remain at home, social norms (male dominated), role conflicts (role definition for men and women) and no exposure to entrepreneurship skills (Figure 1).

Global Scenario of Economic Impact of Women Entrepreneurs in Leading Industrialized Countries

The study by OBEC made on the economic impact of women's entrepreneurship. These studies define women's entrepreneurship as firms owned and managed by women (Table 1). In Canada, The Prime Minister's Task Force on Women Entrepreneurs (2003) has assembled statistics from Department of Statistics, Canada on women entrepreneurs. They found that there is more than 821 000 Canadian women entrepreneurs and they contribute to an excess of CAD 18 109 million to the economy annually. Between 1981 and 2001, the number of women entrepreneurs increased to 208%, compared with a 38% increase for men. However, average annual sales for women-owned firms are significantly lower. In 2000, women-owned SMEs averaged CAD 311 289 in sales, compared with 654 294 in sales for firms owned by men. In the United States the latest analyses from the US Census Bureau estimate that women owned and managed firms represent 28% of the 23 million firms (amounting to 6.4 million) and they provide employment for 9.2 million people. That represents 9% of all employed in the private sector. There are a total of 1.03 million women-owned businesses in Germany. Women-owned and managed businesses having annual turnover of at least Euro 16 620 number 522 000, represent 18% of the total in this group, and provide jobs for 2 million employees (Kay *et al.,* 2003). Both the rate of women entrepreneurs and their economic impact are quite similar in both these economies. In Sweden, we can observe that the entry size for new firms differs between men and women. Women have on average 0.6 full time employees and men have on average 1.7 full time employees. Furthermore, while women-owned businesses have been smaller than their male counterparts, the difference in size seems to be diminishing. Examining other countries such as the United Kingdom and Korea, we can observe that women represent a growing part of the self-employed (26% of all self-employed in the UK in 1999) and that they represent an important part of the small business population (36% of all firms in Korea in 2001). Therefore, based on these results, we can conclude that at least for these countries (and there is no evidence of the contrary for any other country) that women's entrepreneurship represents an important economic strength that is able to generate both substantial sales and employment for themselves and others.

Apart from these schemes, governmental and non-governmental training institutes were established to organize and conduct training programmes for entrepreneurs to impart necessary skills and knowledge about financial, technical and managerial aspect of business and also giving infrastructural support for establishing new business enterprise. Many development projects target women to take up enterprises to bring socio-economic empowerment.

Among them, the International Development Research Centre (IDRC), Ottawa, Canada, with the financial support of the Government of Canada provided financial assistance through the Canadian International Development Agency (CIDA) for the project entitled 'Enhancing Food Security of Rural Families. Through Production, Processing and Value Addition of

Regional Staple Food Grains in India' is one. The project was implemented during the period 2010 to 2013.

Gender Concerns in the Project

The benchmark study conducted in the project villages among the farmers growing little millet revealed that women participate in over 60 per cent of the activity related to production and post-harvest processing practices. Most of the activities carried out by women are labor intensive that demand time and drudgery. Hence the issue of drudgery and gender mainstreaming was addressed by the project with following focus

- Need to focus on drudgery related interventions to save women labor time. It includes crop production, weeding, processing and also activities that reduce reproductive time like fuel efficient smokeless chula.
- Explore how interventions have intensified gender work load and enhanced yield and how in turn returns are used.

In this background an analysis of women time management and scope for starting up of enterprise by women was explored through participatory techniques such as activity chart and access and control analysis. Entrepreneurship development programs were conducted for women followed by skill development programs especially on processing of millets such as little millet and fox tail millet. Activities were introduced among interested women group. It was felt essential to study the impact of project interventions on women, opportunities and constraints.

Methodology

The study was conducted in two villages of Haveri districts where IDRC has implemented project interventions related to processing of millets during the period 2010-13. The study has used the secondary data on processing of little millet and fox tail millets by group of women members. Primary data on constrains was collected through personal interview method using check list. Case study was also conducted to assess performance of individual women entrepreneurs. Participatory tools mentioned below were used for data enumeration from women.

Activity chart: The daily routine activity analysis was done with two groups of women namely 'field going' and 'stay at home type' of women.

Access and control: The women access on various resources and their control was also studied with same group of women. Data was presented in percent and pie chart.

Results and Discussion

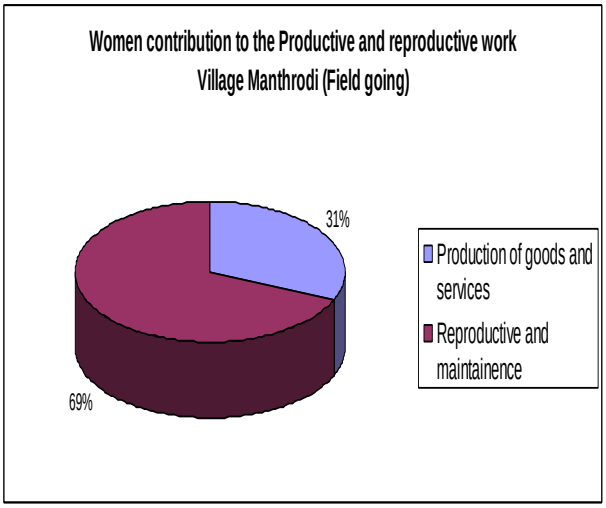
The results presented in table 1 revealed that major time of 'field going' women was spent on cooking (16.67 %), and related activities. Only 29.17 per cent of their time was spent on field work. While in case of 'stay at home' type of women member apart from taking rest/sleep (29.17%), all the time was spent for domestic (reproductive) activities. Comparative analysis of two groups of women brings out the fact that "stay at home" type of women spent more time on domestic activities like cleaning house and grains etc. It was almost more the time taken by field going women members. Women who did not involve in any field activities (productive) were tend to burdened more than the field going or self-employed. In case of women who were involved in any economic activities, were freed from certain domestic work by way of sharing by other family members. The study clearly indicates that type of women involved (Productive or reproductive) also determines in defining her role in the family.

The graphical presentation in Fig.2 revealed that "field going" women spent 30% time on economic (productive) activities, whereas women 'stay at home type' spent most of the time for domestic or family care activities. Women though has greater potential to engage in economic activities, they were continued to do domestic activities due to the role assigned by family culture that is family care including cooking which is women's responsibility. Due to overburdened workload, women were not able to take productive (economic) activities.

'Field going' women were mostly belonging to poor families, where their participation in field as farm labour was essential either to earn daily wage or to support their own families. Family-work constraints can lead women to pull double duty with home and work responsibilities, and in turn restrict business growth rather than encourage it, and give higher priority to their spouse's careers and make sacrifices in their own. This results in smaller employment size, revenues, and income levels of women-led businesses. This study depicts that 88% of women entrepreneurs find a major problem in balancing their work and personal life (Sodani and Maheswari, 2016).

Table 1: Activity profile of women – Field going and stay at home **(**Village: Mantrodi)

Sl.No	Activities	Field going		Stay at home		Difference In time
		Time (hr)	%	Time (hr.)	%	
1	Personal hygiene/daily routine	0.75	3.12	0.5	2.08	0.25
2	Cleaning house	1.5	6.25	2.5	10.42	-1.0
3	Milking	0.5	2.08	1	4.17	-0.5
4	Cooking	4	16.60	4.5	18.75	- 0.5
5	Washing utensils	0.75	3.20	1.5	6.25	-0.75
6	Washing clothes	0	0.00	1	4.17	- 1.0
7	Water filling	0	0.00	2.00	8.32	- 2.00
8	Eating	1.5	6.25	1	4.17	0.5
9	Child care	0	0.00	0.5	2.08	- 0.5
10	Entertainment	0.50	2.08	0.5	2.08	0.0
11	Cleaning grains/hand pounding/milling	0	0.00	1	4.17	-1.0
12	Fuel preparation (cow dung, wood)	0	0.00	1	4.17	-1.0
13	Sleeping	7	29.17	7	29.17	0.0
14	Field work	7	29.17	0	0.00	7.0
15	Leaser	0.5	2.08	0	0.00	0.5
	Total	24	100.00	24	100.00	



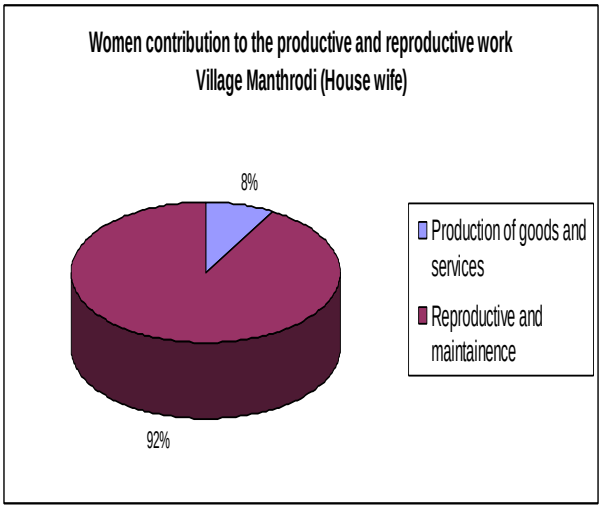


Figure 2: Time utilization by Field going and stay at home type of women

Achievements of Women Group in Managing Millet Processing Unit

Among women entrepreneurs groups in the project villages, one group had taken up millet processing such as little millet and foxtail millet. Though the farm families in the villages were growing these two millets, they were not able to consume them due to lack of processing facility. Hence, project encouraged women group to establish millet processing, so that it would pave way for consumption as well as their livelihood. The group started with small machine fabricated by project team with expert advice from scientists of Mc Gill University, later the group modified the machine to suit their requirement.

The progress made by the group during one year is presented in Fig.3. It is clear from the data that there is substantial increase in the processing quantity of millets during last year. The group was able to receive revenue of rupees 35,000 to 40,000 per annum (Table 2). Israel Oliver king (2016) reported that grain processing activity by women group facilitated the demand for local consumption and opened new opportunities for production of traditional and novel value added products and their commercialization and income generation. Thus women entrepreneurs are now exploring the untapped potential in value addition and discovering the nutritional and economic benefits of millets.

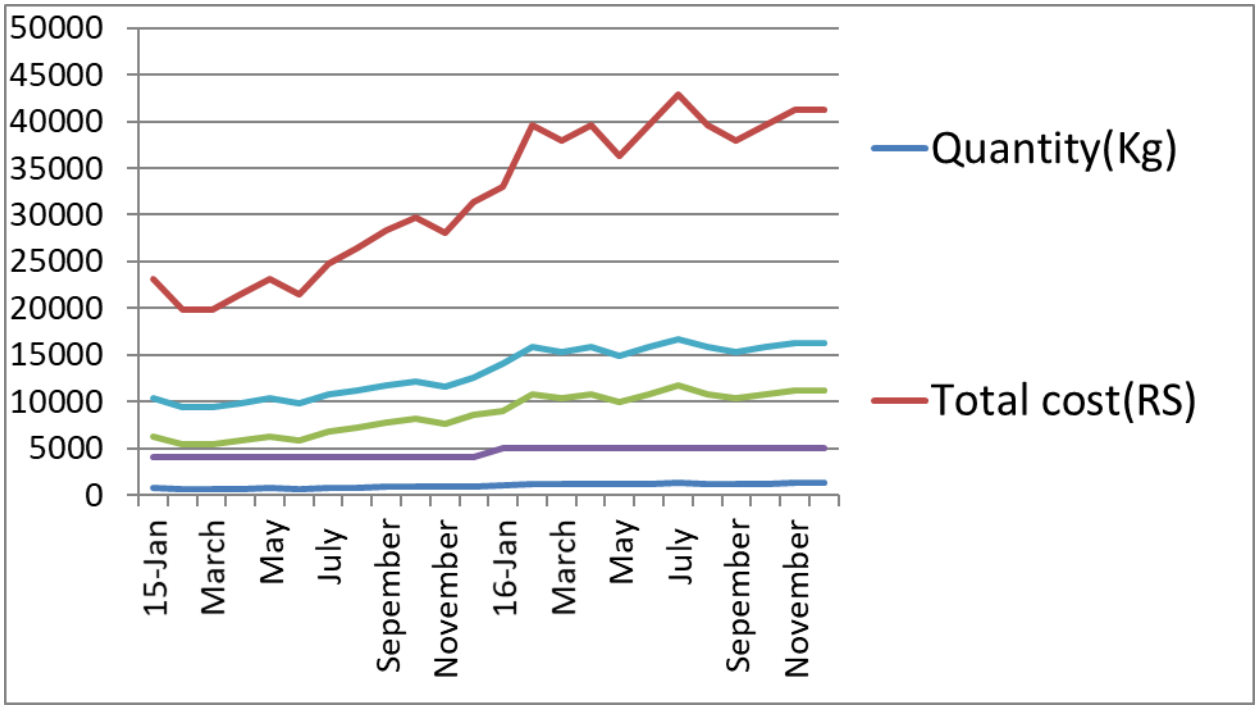


Figure 3: Processing of millets by women group during 2015 and 16

Table 2: Details revenue of women group from millet processing and service charges

Month	Quantity (Kg)	Total cost (Rs)	Net Profit (Rs/month)	Revenue from service (average 500kg)	Total income (Rs)
15-Jan	700	23100	6300	4000	10300
February	600	19800	5400	4000	9400
March	600	19800	5400	4000	9400
April	650	21450	5850	4000	9850
May	700	23100	6300	4000	10300
June	650	21450	5850	4000	9850
July	750	24750	6750	4000	10750
August	800	26400	7200	4000	11200
Sepember	860	28380	7740	4000	11740
October	900	29700	8100	4000	12100
November	850	28050	7650	4000	11650
December	950	31350	8550	4000	12550
16-Jan	1000	33000	9000	5000	14000
February	1200	39600	10800	5000	15800
March	1150	37950	10350	5000	15350
April	1200	39600	10800	5000	15800
May	1100	36300	9900	5000	14900
June	1200	39600	10800	5000	15800
July	1300	42900	11700	5000	16700

Month	Quantity (Kg)	Total cost (Rs)	Net Profit (Rs/month)	Revenue from service (average 500kg)	Total income (Rs)
August	1200	39600	10800	5000	15800
September	1150	37950	10350	5000	15350
October	1200	39600	10800	5000	15800
November	1250	41250	11250	5000	16250
December	1250	41250	11250	5000	16250

Indirect Benefits of Millet Processing by Women Group

Though women groups were encouraged to take millet processing that provide them regular income, there were many indirect benefits experienced by the community as a whole. Those indirect benefits are listed below:

SN	Before Processing at Village	After Establishment of Processing Unit by Women Group
1	Millet produce to be sold to the middle man	Farmers has option to process and sell or sell without processing with higher price
2	The price offered was low	Price offered is high
3	Low/No consumption of millets at home due to lack of processing facility	Consumption has slowly increased
4	Livestock were reduced due to lack of fodder	Fodder availability for livestock
5	More drudgery for women	Low/No drudgery for women

Changed Situation

It is clear from the graph (Fig.4), that the 'stay at the home' type of women were able to adjust with domestic activities up to 29.17 per cent (one third), however they continued to involved in domestic or family care activities. It was possible with support of family members.

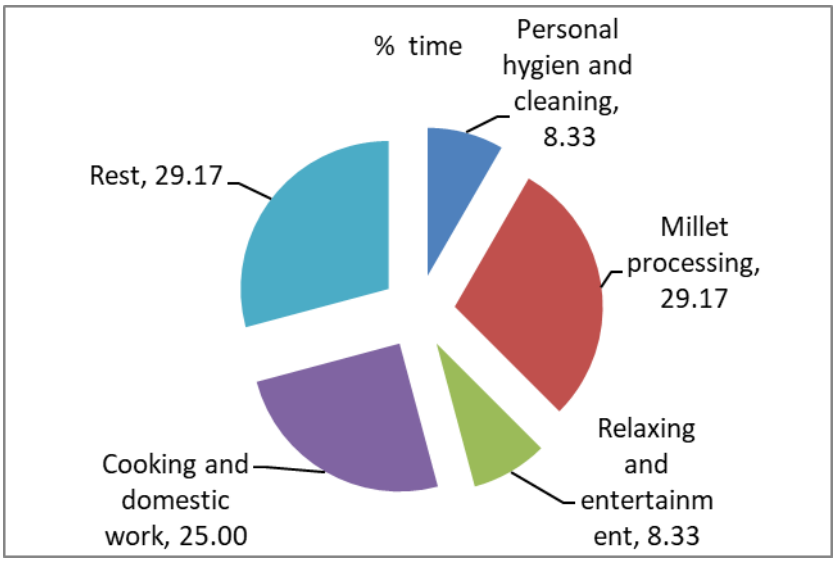


Figure 4: Activity chart of 'stay at home' type of women after taking up an enterprise

Emerging Opportunities for Growth

The women group has set a good example of managing millet processing unit. The members of the group expressed that they have growth opportunities to expand their business which are listed below.

1. Processing unit used by them has maximum of 300 kg per day of 10 hours. However the demand is 3000 to 5000 kg per day. To meet this demand, the group has to adopt higher capacity machines
2. As millets are fiber rich and contain higher level of proteins and minerals, it is being prescribed by Doctors. Hence they are also getting indents for supply from the hospitals and individual doctors.
3. Traders from big towns are approaching groups for supply of processed millets.
4. Increasing consumption trend

Millet Cafe on Highway: A Case Study

Iramma Jolad a polio stricken lady who was finding it difficult to work as agricultural labourer is very happy to have started entrepreneurship of value added millet products. She runs a roadside canteen on a wheeler which was provided to her through the IDRC millet project. Every morning Iramma and her husband take the wheeler to the main road where they get customers for breakfast and tea. Iramma says that little millet idli has a great demand followed by paddu and puri. In the evening the couple sells egg rice, the most coveted food of drivers. She uses daily 5-6 kg millet for preparation of breakfast items and per day earning is around Rs 1500-1700.Cost per day is around Rs 500-600. Net return is around Rs 1000-1200.

Family involvement: She is able to manage both the household and entrepreneurial responsibilities as her husband fully supports her in this regard. Prior to starting sale of millet products her husband owned a maize sheller which fetched him an average income of Rs.

5000/- a month. Moreover the employment from the maize sheller was seasonal and at times he would remain jobless. He sold the sheller off as he did not find it profitable. The couple is now happy that the present business fetches them a good amount of income and provides regular employment. Both the husband and wife start working from 4 am in the morning. The work continues till 10.30 am. They are free to take some rest and do their household work till 3 pm. Their evening business goes up to 10 pm. Their day ends by 11 pm at night. Has it affected their health? No says Iramma. In fact according to her they have not fallen sick after they started this business. The credit goes to millet idli and paddu which they consume regularly, says Iramma.

Procurement of ingredients: She purchases all the ingredients needed for her business from Shiggaon market. At a time she purchases provisions worth Rs. 10000/- which suffices her for one to one and a half month.

Assets purchased: After starting the millet café, she has managed to purchase an LPG connection with 2 cylinders, a flask for keeping the tea hot, a flash light needed for the business in the evening, a pressure cooker, an *idli* cooker, plates, spoons, tumblers and 4 plastic chairs.

Improvements in the family: No more loans , full time job for both the husband and the wife, able to give computer education to the daughter, improved health, built toilet and did two daughter's marriage.

Benefits Realized by Women Entrepreneur

Some of the important benefits realized by women entrepreneurs are listed below:

1. Shift from daily wage employment to own enterprise
2. Overcoming the problem of uncertainty in farming
3. Assured daily income available for children education and livelihood
4. Significant improvement in physical and social capital acquasition
5. Linkages with development agencies and projects

The study conducted by Sodani and Maheshwari (2016) observed that 80% women entrepreneurs find a major problem in balancing their work and personal life. 76% of women entrepreneurs by their female nature hesitate to take risk as they find themselves less trained in the field of entrepreneurship. The workload associated with being a small business manager also is not aily combined with taking care of children and family. However, even if the revenues are somewhat smaller, women entrepreneur feel more in control and happier with their situation than if they worked as an employee (Loscocco, 1993).

Problems Faced by Women Group

Though group is enthusiastic, in processing and supply of millets, it has faced with certain problems listed below.

Table 3: Problems faced by the women

SN	Problems	Rank
1	Non availability of zero polish machine for high volume production	I
2	Procurement of millet from distant villages add to the cost	II
3	Family responsibility do not allow to devote complete time	III
4	Repair and maintenance service of machine not available locally	IV
5	Sales outside the village is difficult by women	V
6	Low working capital delay maintenance	VI
7	Non availability of high volume tested machines	VII
8	Lack of reserved capital	VIII

Major problem encountered by women was non availability of zero polish machine for high volume production. The women group has created demand among the customer due to their quality of processed millet which ensures zero polish. Zero polish grains have high nutritional value, hence it is most preferred. With increase in their production they are not able to get the machine of higher capacity that ensures zero polish grain. It was observed during the investigation that group members have apprehension of losing the customers if they are not able to produce the millet of required quality. Other problems experienced by them were procurement from the distant villages. With increase in the processing quantity they need to procure from distant farms which add to the cost. All farmers do not bring their produce to the unit. Family responsibility and customers have added obstacles to women entrepreneurs. In spite of good earning from the micro enterprise, they were not freed from some of the reproductive/domestic works. Other problems in lower order appear to be financial constraints and technical service at village level. There is need for a holistic policy which not only encourages women entrepreneurship but also assists them in up scaling and addressing the emerging problem. Sodani and Maheshwari (2016) observed that 64% female entrepreneurs faced problem of assembling finance while starting their business and finance for its further growth. The demands associated with running the business and home may therefore restrict the growth and potential success of many women-owned businesses. 60% of females are barred by running their business successfully due to the family responsibilities.

Conclusion

Women member have great potential to become successful entrepreneur. However family ties, norms and role for men and women obstruct their participation in economic activity. Given the opportunity and necessary environment they proved to be most successful. In a society where women roles are more to domestic activities, support the families in terms of encouragement, discharging from domestic work and society to see them as resource is essential condition for socio- economic developments the family but also equality among men and women.

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Natural Resource Management with People Participation - A Key to Bring Agriculture Development

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The degrading trend of natural resources has posed serious challenges to agriculture production and sustainability. The study conducted in in Chitradurga district of Karnataka state reveled that natural resource management (NRM) are pre requisites for bringing long term improvement in agriculture production. Participatory rural appraisal methods were used in identifying the interventions and their execution with people participation. PRA data was digitized for monitoring and impact assessment. Total of 787 plots in an area of 933 hectares belongs four villages were covered with watershed interventions. There was direct and cumulative effect of watershed treatments on yield of main crop like maize and pigeon pea. The net increase in yield of 1.05 and 0.47 quintals was observed in case of Maize and Pigeonpea, which amounts to 5.75 and 180.42 percentages of additional yields and income of Rs. 1200 and 2350 respectively. The immediate benefits realized by farmers included reduction in soil erosion and good crop stand during dry spell due to water conservation as well as improved ground water table. The water harvesting within the bunds was observed to the extent of 0.36 meters height and 2.41 meter length each time, it rained and such water harvesting events occurred 3-4 times during rainy season. Crop productivity enhancement activities should essentially follow the soil and water conservation measures especially in higher slope lands. The study observed that expenditure up to Rs.12000 to 15000 per hectare ensures effective treatment of watershed and additional income up to Rs. 7500 to 10000 per ha/year can be realized from subsequent year of crop production activities. Farmers' contribution by cash is essential to enhance participation and ownership of project activities.

Keywords: Natural resource management, people participation, crop productivity

The natural resources base of a region includes the elements of climate, land, water, soil and biodiversity. They determine the opportunities for livelihoods in general and farming in specific. In India, the prime natural resource is 328.73 million hectares of land of which 143 million ha are arable lands, 14.81 million ha are fallows and 37.16 million ha common lands and 69.63 million ha are forests, with the rest accounting for 43.22 million ha. Widespread, serious and continuing degradation of India's natural resource base is now reflected in increasing difficulties in achieving growth rates in agriculture. Several government and non-government agencies have launched watershed development project with an objective of soil and water conservation, improving land productivity and appropriate technologies for efficient and sustainable use of natural resources. However many watershed projects around

the world have not performed well because of poor community participation (Johnson et al 2001).

Globally, agricultural production systems depend on natural resources such as land (over 55 percent of non-forest land), water (about 80 percent of total fresh water), biodiversity, forests, pastures, and wildlife. Farm activities can also have major impacts on the quality and availability of these resources well beyond the boundaries of the production system (for example, downstream pollution and soil erosion). Although natural resources are critical to agricultural production, farm households also frequently depend on them to meet other needs, such as fuel, construction materials, and supplemental foods. Thus rural livelihoods are intricately linked to the condition of natural resources, particularly for those 1.3 billion people living on fragile lands. Over the last 40 years as food production has doubled, agricultural production systems have expanded, with significant impacts on the natural resource base.

Population growth and economic development are increasing pressure on land, water, forest, and biodiversity resources. Planning in the traditional system was often based on the capacity of land rather than needs and capacities of local people (Rhoades and Eliot, 2000). There exists a gap between what might technical person recommends and the actual need or a problem. Hence, participatory watershed management has emerged as a strategy where farmers and technical persons discuss and analyze various options and community finally decides on the activites.

Participatory approaches have been adopted as a strategy in watershed development project in India. Participatory approach gained importance during late 1980 to ensure sustainability of watershed interventions. It emphasize on adopting participatory tools in natural resource management, promotion of people institutions and encouraging people contributions.

Natural resource management was taken up as one of the interventions in alternative livelihood project implemented during 2008 to 2012 under corporate social responsibility funds of SESAGOA Ltd.(iron ore mining company).Participatory approach was adopted in the project to empower the community and share responsibility and build ownership among the people. Crop improvement was another intervention in the project. It was observed that interventions in NRM not only achieve conservation of resources but contributes significantly to the crop productivity.

Participatory Approach in Watershed Management Followed in The Project

High degree of soil erosion was evident in the project villages due to higher slope (6-8 percent) with shallow soil and only one crop per year was taken up by the farmers. The situation before watershed development intervention was as follows:

1. Higher land slope and no conservation measures have resulted in low productivity.
2. Mono-cropping (Maize) is being practiced by farmers with high application of N and P fertilizers.

3. The farmers were getting moderate yield in case of both maize (25-30 quintals/ha.) and cotton (30-45 quintals/ha)
4. The cow and buffalo are maintained by most of the families. The economic returns are very low, because of local breeds and poor management

Considering the above problems, natural resource management was considered most important.
Following activities were involved in participatory NRM:

1. Sensitization of the community on soil erosion-causes and consequences: This was done with series of group discussions among the community members.
2. Identifying ways and means to overcome the problem: Discussion was initiated with the community on ways and means to conserve the soil. Among various methods watershed management emerged as most appropriate.
3. Primary data collection and analysis: Primary data on total land holding, crop management practices was collected and analyzed to understand the cause and consequences.
4. Participatory Rural Appraisal (PRA) tools in planning: Social maps and resource map were used extensively to understand community composition and resources. Transact walk were used to document the problems, resources and watershed interventions.
5. Geographical Information System (GIS) application: The social maps and resource maps depicting the household and plots respectively were digitized and GIS package was used to generate maps and priorities the activities (Fig 1)
6. Finalization of the watershed treatment plans: The watershed treatment so prepared was finalized in general assembly of the village.
7. People institutions to implement and monitor the project interventions: Following people institutions were formed to share the responsibility:
    a) Watershed development committee
    b) Users groups
8. People contributions: People contributions were encouraged. Community decided to collect Rs 250/- per ha in cash and deposit the same in the joint account for future maintenance.
9. Implementation responsibility by community: The implementation of the treatment plan was given to the community.
10. Follow up and monitoring: Regular monitoring and maintenance responsibility was taken by the community.

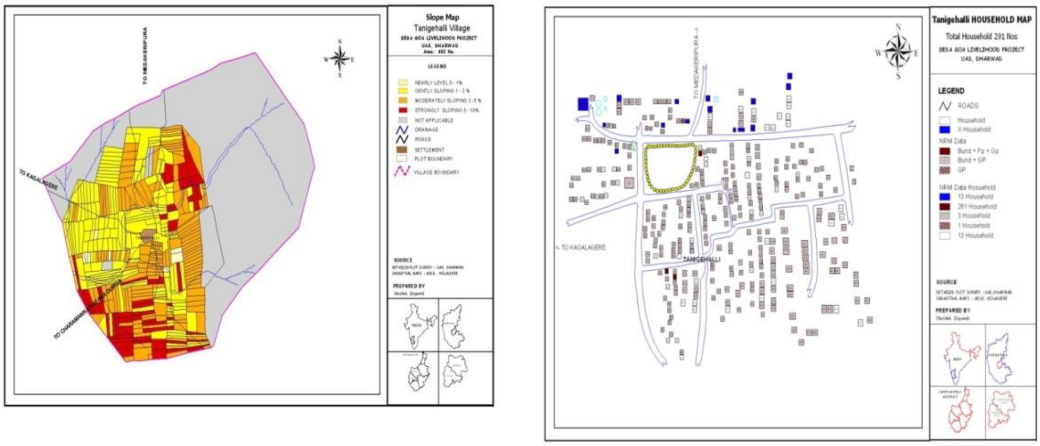

Figure 1: GIS maps depicting features of households and plots of the farmers

Watershed treatments were taken up in phased manner in micro watersheds of the four villages (Table 1). Watershed treatments such as soil and water conservation measures, forest/grass plantation etc. were decided by the community members. The project covered total of 1074.60 ha land under NRM interventions. It comprised of four villages each with catchment of 120 to 318 ha of land (Table 1).

Table 1: Area covered under watershed treatments in project villages

SN	Villages	During project period	
		No. of Farmers	Area (ha)
1	Meghalahalli	136	142.8
2	B.N.Halli	154	120
3	Madikeripur	217	351
4	Tenagihalli	280	318
	Total	**787**	**1074.6**

Methodology

The study was conducted in Chitradurga district of Karnataka state located in southern part of India. Simple random sample procedure was followed to select sample units of 80 beneficiary farmers. Focused group discussions were used to document overall impact of NRM initiatives and crop production practices. Data was collected by personnel interview method.

Results and Discussions

The community members of the project villages consists of mainly very small farmers with less than 1 ha land (65%) followed by small farmers having 1-2 ha (18%) and remaining were medium and large farmers (Fig-2).Due to their low land holding and crop cultivation under rain fed condition, most of the farmers was found depend on daily wage employment in mining site. Thus low attention was given to farming. The data related to their consumption pattern revealed that, community members consume very low quantity of fruits (3 %) and vegetables (10%) in their diet (Fig 3). It was mainly due to low production of fruits and vegetables in their farm and low affordability by them.

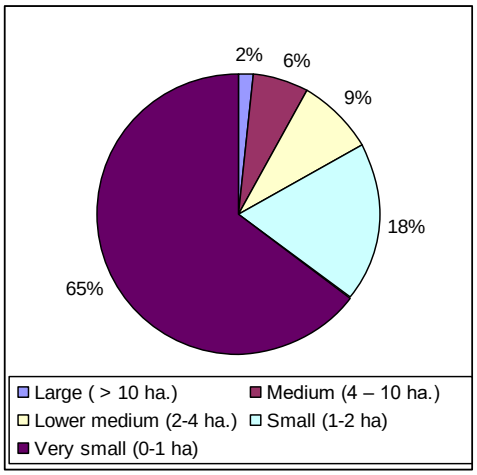

Figure 2: Community composition of project village rural families per month

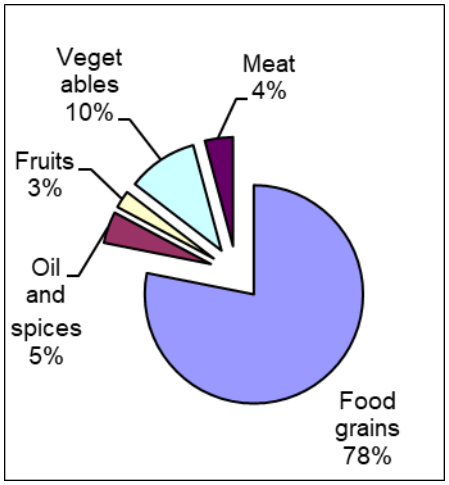

Figure 3: Proportion of fruits and by vegetable consumption

The watershed interventions in the project villages were implemented in three years period as shown in the table 2.

Table 2: Watershed development interventions in the project villages

Year	Villages								Total	
	T.NHalli		B.NHalli		Megalhalli		Madekeripur			
	Area	No. of farmers	Area	No. of farmers	Area	No. of farmers	Area	No. of farmers	Area	No. of farmers
2008-09	315	81	0	0	0	0	0	0	315	81
2009-10	239	97	115	87	205	79	271	77	830	340
2010-11	243	102	185.25	67	152	57	608	140	1186.6	366
Total	**797**	**280**	**300.25**	**154**	**357**	**136**	**879**	**217**	**2331.6**	**747**

Watershed Treatments

Watershed treatment implemented in the project included graded bunds, waste weirs, farm ponds and different types/size checks(Table-3). The treatments were decided by transact walk where possible treatments were discussed with farmers on the site based on the problem situation and resource availability. The watershed treatments mainly included graded bunds (158846 rmt) and waste weir (370 no).The land terrain was very sloppy and soil was shallow. Hence most suitable treatment found was graded bunds which were made by opening the trenches. All these bunds were supported by waste weirs. Though there was scope for more number of farm ponds, farmers did not accept as they feel they lose the some land for the pond. However , some of the farm ponds were made for demonstration purpose.

Table 3: Watershed treatments implemented in the project villages

Sl. No	Treatments	Number	Length in meters
1	Graded bunds (0.72 sectional area)	28764	158846
2	Waste weirs (boulder type)	370	6573.4
3	Farm ponds	13	-
4	checks 7 m length	25	289.74
5	Rubble filled checks 8m length	12	84
6	Rock filled dam (15 mt length)	20	-
7	Bund covered with grass seeds	-	56000
8	Earthen bund	-	23328
9	Trenches	3888	-

Sl. No	Treatments	Number	Length in meters
10	Bund	-	116.81

Impact of Watershed Treatment on Crop Productivity

There was direct and cumulative effect of watershed treatments on yield of main crop like maize and pigeon pea. The data on crop yield of sample farmers was collected and analyzed. It was found that the conservation measures directly contribute to the crop yield during first season. Substantial increase in the crop productivity of maize, pigeon pea was observed. The incremental yield in pigeon pea was 180 per cent while in case of maize it was 5.75 per cent (Table 4 and Figure 4)

Table 4: Difference in the crop yield of maize and pigeon pea intercrop before and after the watershed treatment

S.No	Crops	Average yield (kg/ha)		Difference (kg)	Percentage	Additional income (Rs.)
		Before	After			
1	Maize	4565	4827	262	5.75	3250
2	Pigeon pea	65	182	117	180.42	5875

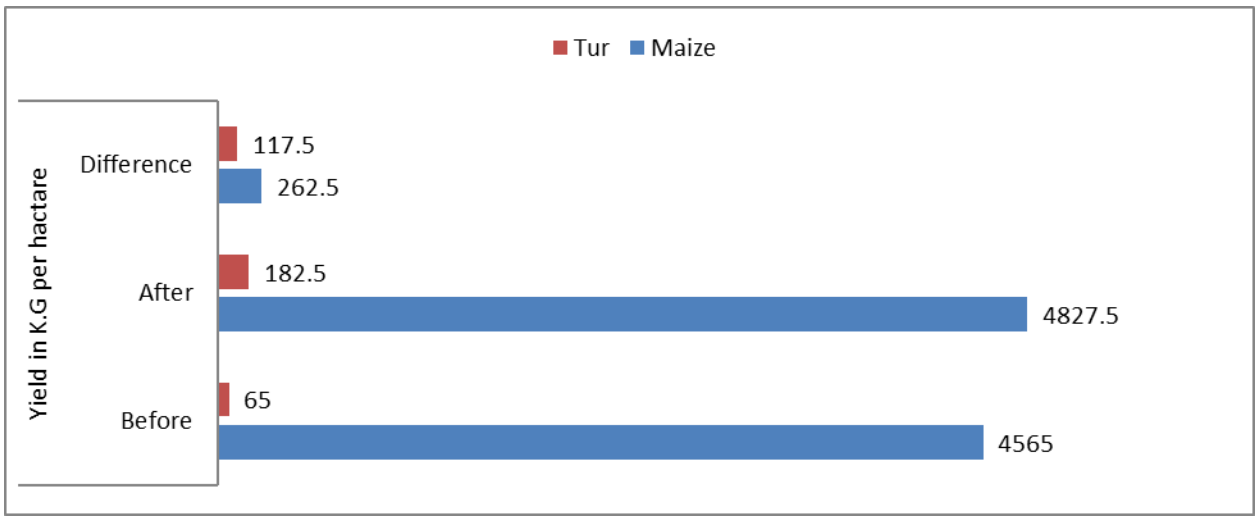

Figure 3: Impact of Watershed Treatments on Crop Yield

Benefits Realized from Watershed Development Interventions by The Farmers

The immediate benefits realized by farmers includes reduction in soil erosion and good crop stand during dry spell due to water conservation as well as improved ground water table (Table-5). The trench cum bund has resulted in *in situ* moisture conservation apart from checking soil erosion. The earthen bunds established in most of the field resulted in

conservation of water and improvement in soil moisture. Shah (2001) observed that many farmers in the watershed development area reported an increase in soil moisture level.

Table 5: Benefits realized by watershed development activities (n=80)

SI.No.	Benefits	Freq.	Percentage
1	Reduction in soil erosion	61	76.25
2	Water conservation	46	57.50
3	Increasing moisture holding capacity of soil	17	21.25
4	Good crop stand during dry spell	4	5.00
5	Increase in crop yield	29	36.25
6	Increase in ground water level	64	80.00
7	Land slope reduced	60	75.00

Among different soil and water conservation measures, trench cum bund was found more effective in the area where slope was more than 6 percent. The water harvesting within the bunds was observed to the extent of 0.36 meters height and 2.41 meter length each time, it rained and such water harvesting events occurred 3-4 times during rainy season. (table 6). Several studies were conducted to assess the contribution of participatory watershed programs (Turton et al 1998, Kerr et al 2002, Wani et al 2005, Joshi et al 2003 and Reddy et al 2004) all these studies observed positive impact of participatory watershed projects in different places.

Table 6: Water conservation within the earthen bunds

Particulars	Average
No of times	3
Height (feet)	1.23
Distance (meter)	2.41

Adoption of Improved Intercropping System by Farmers

Farmers in the study were growing maize and pigeon pea with row proportion of 6:1 and 7:1. It was followed traditionally since many years. However the yield of pigeon pea was very low due to shade effect and low space given. Hence improved method at the row proportion of 4: 2 was introduced through on farm demonstrations and farmers field schools. It was

observed that majority of the farmers had switched over to new method as it had given good yield without affecting the yield of maize crop (table -7). The average yield of 4715 kg per ha was obtained from maize crop and 245 kg per ha from pigeon pea crop was recorded, while in case of farmers practice it was 4400 kg per acre in maize crop and 136.2 kg per ha in pigeon pea crop observed. The difference in the pigeon pea was almost double than the traditional method. Productivity gains were reported to be greater in case of rain fed crops (Renfro 2005). They had observed that rain fed crops (eg. soybean and legumes) increased by as much as by 280 per cent.

Table 7: Adoption of improved practices by farmers

SI No.	Village name	Improved practice Avg. yield (kg/ha)		Farmers practice Avg. yield(kgl/ha)	
		Maize	**Pigeon pea**	**Maize**	**Pigeon pea**
1	B.N.Halli	4625	245	4250	102
2	Meghalahalli	4700	280	4500	145
3	Konanur	5000	250	4750	167
4	Madakeripura	4750	192	4000	130
5	Tenagihalli	4500	262	4500	137
	Average	**4715**	**245.8**	**4400**	**136.2**

People Contribution for Watershed Treatments

As a part of participatory watershed management strategy, people contribution was considered as one of the components. Community decided to collect Rs 250 per ha in cash and families should work voluntarily in their field. The cash collected was deposited in the joint account of village watershed development committee. The details of cash collected is given in table-8.The community was able to collect Rs 286217 as people contribution which amounts to about 2 -3 per cent of the project cost. The people contributions in cash had enhanced people participation and enabled to build the sense ownership among the members.

Table 8 : People contribution for watershed treatments

Sl No.	Villages	Contribution (Rs.)	
		2009-2010	**2010-2011**
1	Tanigehali	7500	49900
2	B.N.Halli	18500	37850
3	Madakeripur	25000	112300
4	Megalhalli	20500	14667

Total	**71500**	**214717**

Conclusion and Policy Implication

The study draws following conclusions based on the results:

1. Community participation in NRM and crop management results in higher level of adoption of conservation and crop production practices.
2. Public private investments in natural resource development can be recovered in three year period.
3. Farmers contribution by cash is a check to ensure participation and ownership of project activities.
4. Production technologies with intercrops increase the cropping intensity, yield and income by 25 to 50 percent.
5. Improved practices contributing to significant change in the yield had higher acceptance and adoption by farmers.

As a policy it is recommended that all natural resource management projects should necessarily adopt participatory approach by adopting participatory tools, encourage people institutions and also cash contribution to empower community and build ownership for sustainable development.

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Analysis of Factors That Affect the Income of *Krupuk Kukut* Home Industry in Realizing Agricultural Entrepreneurs in the Field of Agricultural Economics in the Province of Aceh

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The quantity of large-scale farm animal populations (cattle and water buffalo) that is considerably high in the Province of Aceh can be seen in the yearly number of slaughters by type in 2014, which for cattle was 511,362 animals and for water buffalo was 166,903. Thus in addition to making use of the meat and bones for consumption, the skin can also made into a stomach pain reliever popularly called as ***"Krupuk Kukut"****. This research aims to analyze the factors that affect the income of krupuk kukut (cracker made of cattle and water buffalo skin) home industry enterprise in realizing entrepreneurship spirits in the field of agricultural economics in the Province of Aceh. The data used are in the form of secondary data obtained from the Department of Industry, Trade, and Co-Operatives of Aceh Barat Regency and the Department of Industry and Trade of Aceh, while primary data is obtained through interviews with entrepreneurs in 2016. The sampling technique used is a cluster sampling of 23 regencies/cities, with the multiple linear regression analysis method.*

Based on the research, it was found that the average income of this enterprise is Rp. 13,926,250/month, at a price of Rp 25,333.33/package for a quantity of 544.17 units with a coefficient of determination value of 1.000. The equation for the multiple linear regression is $Y = -17.928X_1 + 26437.992X_2 + e$ *and the t-count value for price is -2.210; the quantity of 82.922 is significant at* $\alpha = 5\%$ *and the F-count value is 11997.903. It is highly recommended for the local and Province of Aceh governments to pay attention toward the continuity of this krupuk kukut enterprise, for example by providing technical and non-technical assistance (training for entrepreneurs in this field, or additional capital) to create strong-minded entrepreneurs.*

Keywords: income, price, quantity, krupuk kukut, entrepreneurs

Introduction

The current up-to-date era, in particular the current state of the world economy, demands that enterprise development should not be separated from business competition, where profits are the primary factor for producers in running their businesses.

The success of the industry and trade sectors in Indonesia has provided enormous contributions in creating the national economic structure. Small industries in Indonesia are an important part of the national economic system, because they play a role in accelerating the equalization of economic growth through the missions of providing employment opportunities, increasing the income of the people, and becoming involved in increasing fund collection as well as strengthening national industries. In the context of Local Economic

Development, the presence of small industries has an important role. Industries develop because of the spirit of local entrepreneurs. In addition, the economic activities of small industries tend to prioritize the utilization of local resources, especially input of raw materials and labour. As such it can be said that the presence of small industries can potentially become the mover for the growth of local economic activities in a particular region [1].
Further, the Province of Aceh as a part of Indonesia has a considerably high number of large-scale farm animal populations (cattle and water buffalo), which in 2014 as seen from the number of yearly farm animal slaughters by type numbered to 511,362 for cattle and 166,903 for water buffalo. Thus in addition to making use of the meat and bones for consumption, their skins also have the potential of being developed in the fields of industry and health as a stomach pain reliever in the form of cattle or buffalo skin crackers, popularly known as ***"Krupuk Kukut"***.

The presence of this cracker industry is expected to be able to increase the income of the people, so that a number of people or groups are willing to become entrepreneurs in the field of agricultural economics and elevate the economy through the development of the potential of a region.

This research aims to analyze just what factors affect the income from the *krupuk kukut* (cattle and water buffalo skin cracker) home industry enterprise, in realizing entrepreneurship spirits in the field of agricultural economics in the Province of Aceh.

Materials and Methods

Population and Sample. The population in this research covers the entire cattle/water buffalo skin cracker industry and related industries in the Province of Aceh. The sampling technique in this research is cluster sampling with as many as 12 respondents of entrepreneurs spread out among 23 regencies/cities in three regions, which are Barsela (9 businesses), Central-Southeast (1 business), and North-East/ provincial capital region and hinterlands (2 businesses).

Data. This research uses primary and secondary data, which are secondary data from interviews conducted with questionnaires and primary data from the Department of Industry and Trade of Aceh and the Department of Industry, Trade, and Co-Operatives of Aceh Barat Regency.

Method of Analysis. The following are the methods used and their explanations:

1. Multiple Regression Analysis

Multiple regression analysis is used as a tool to predict the influenced value of a dependent (bound) variable (Y) in relation to one or more independent (free) variables (X_1, X_2, … and so forth). The multiple regression analysis equation is [2]:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Next, because the function of income does not have a constant, the equation above becomes:

$$Y = \beta_1 X_1 + \beta_2 X_2 + e \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where:

Y = Dependent (bound) variable (Income)

a = Constant/intercept

b = Regression coefficient

X_1 = Independent (free) variable (Price)

X_2 = Independent (free) variable (Quantity)

2. Correlation Analysis (r)

a. Multiple Correlation Coefficient Analysis

Correlation analysis is an analysis that is performed to understand the relationship between two variables or more, as variable(s) X (free/independent variable) and variable Y (bound/dependent variable).

b. Coefficient of Determination Analysis (r^2)

This analysis is performed to see how great the free/independent variable(s) (X) contribute to the bound/dependent variable (Y). Thus it can be said that the coefficient of determination (r^2) is the square of the coefficient of correlation.

The formula for the coefficient of determination is: [3]

$$KP = r^2 \times 100\% \quad (3)$$

Where:

KP = Value of coefficient of determination

r = Coefficient of correlation

3. t-Test

This test is used to test the hypothesis of a parameter if the sample size is small ($n \leq 30$) and the diversity of population is unknown.

4. F-Test

This test is used to perform the hypothesis testing of the regression coefficient (slope) simultaneously.

Results and Discussion

Development of the *Krupuk Kukut* and Related Enterprises in the Province of Aceh

The following are the data of the *krupuk kukut* home industry enterprise in this province, obtained from secondary [4] and primary data.

Table 1: *Krupuk Kukut* Home Industry Data in the Province of Aceh, 2016

No	Business Name	Sub-District	Regency	Income (Rp)	Price (Rp)	Quantity (Packs)
1	Nurramadhan	Kuta Malaka	Aceh Besar	9,375,000	25,000	375
2	Usaha Mandiri Sanusi	Ingin Jaya	Aceh Besar	17,342,000	26,000	667
3	Boga Sari	Karang Baru	Aceh Tamiang	7,500,000	25,000	300
4	UD.Fajar Industri Anwar Yusuf	Johan Pahlawan	Aceh Barat	22,491,000	27,000	833
5	Admajaya Mawarni	Johan Pahlawan	Aceh Barat	39,832,000	26,000	1532
6	Rajawali	Johan Pahlawan	Aceh Barat	9,000,000	25,000	360
7	Usaha Bacut-Bacut	Johan Pahlawan	Aceh Barat	9,500,000	25,000	380
8	Mardhiah	Johan Pahlawan	Aceh Barat	8,750,000	25,000	350
9	Beringin Jaya	Johan Pahlawan	Aceh Barat	9,000,000	25,000	360
10	Cirasa	Johan Pahlawan	Aceh Barat	4,575,000	25,000	183
11	Nyak Bulen	Samatiga	Aceh Barat	16,250,000	25,000	650
12	Aneuk Laot	Samatiga	Aceh Barat	13,500,000	25,000	540
	Total					

Source: Department of Industry and Trade of Aceh and Primary Data, 2016

Based on the table above, the highest production of *krupuk kukut* and similar items is 1,532 units or 383 kg/month, while the lowest is 183 units.

Based on the processing of the data with SPSS, it was found that:

1. Analysis of Coefficients of Correlation and Determination

The Coefficient of Correlation of the variables of price and quantity was found to be 1.000, which positively shows that there is a strong relationship of price and quantity toward the income of the *krupuk kukut* home industry enterprise in the Province of Aceh, and this was also the case for the Adjusted Coefficient of Determination.

Table 2: Multiple Linear Regression and t-Test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
Price (X1)	-17.928	8.113	-.027	-2.210	.052	-36.006	.150	.844	.573	.014
Quantity (X2)	26437.992	318.829	1.023	82.922	.000	25727.596	27148.388	1.000	.999	.535

Source: Research Results (2016)

Based on the table above, it was found that:

a. The multiple linear regression equation was $Y = -17.928X_1 + 26437.992X_2 + e$
   Based on the above equation, there was no constant value. The value of the price variable coefficient is -17.928, which means that for every 1 rupiah increase in price, income decreases by Rp. 17.928. The value of the quantity variable coefficient is 26437.992, which means that for every 1 pack (unit) increase in production quantity, income increases by Rp. 26,437.992 (equivalent to 1 package of *krupuk kukut*).

b. The t-test was significant at the level of significance of 0.05 with a level of confidence of 95%, where the t value was significant for both variables of price and quantity. The F-test was also such with a value of 11997.903.

Conclusion

Based on the research results, it can be concluded that:

a. The average monthly income of the *krupuk kukut* home industry enterprise is Rp. 13,926.250 with an average price of Rp. 25,335/unit and a production quantity of 544 units.

b. The coefficients of price and quantity is significant at $\alpha = 0.05$ based on the results of the t-test as well as the results of the F-test.

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b. It is expected that the government to pay attention and aid entrepreneurs in the field of *krupuk kukut* to increase the number of and create new entrepreneurs in this field.

c. There needs to be further research by other researchers with even better outcomes.

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Design Metaphor to Improve Interface Usability for Paddy Farmers in Malaysia Using User-Centered Approach

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Metaphor is a representation of object and situation that have meaning and comparable to real thing to convey the message to people. The purpose of using metaphor is to facilitate in making communication more direct and effective for particular user communities. This study reveals design metaphor issues for paddy farmer population in agriculture domain in Malaysia. The work is motivated by the ICT-Based Agriculture Flagship Blueprint of the Malaysia Government, an initiative to equip agriculture stakeholders in Malaysia including farmers with ICT knowledge on multiple platforms e.g. kiosk, personal computer or mobile devices. The metaphors design is deemed to have a huge potential to improve usability for paddy farmers in Malaysia. The work is conducts using user-centered design approach. This approach allows higher degree of paddy farmers' involvement during the development process. Also, to be able to obtains deeper understanding of the farmers' background, tasks and environment. The study has derived a guidelines of metaphor design as well as development of design metaphors based on the guidelines. A prototype of mobile paddy application is developed to demonstrate the practicality of the design metaphors. The design metaphors then are evaluated by conducting usability testing to the farmers. The result is gathered and being assessed by using descriptive statistics.

Keywords: design metaphors, user interface usability, farmers, agriculture

Technology has become part of human life and penetrated every aspect of modern society, not being part of the digital society is no longer an option [6]. The use of information communication and technologies may also have a big impact on socio-economic development of poor communities in developing countries [13, 15, 20]. Mobile technology has become widely spread among the farmer population [6] including paddy farmers [2] in Malaysia. Another study [7] conducted in Malaysia has also shown that the most possessed and popular ICT tools among the agriculture community are mobile phone (97.3%), follows by computer (54.0%) and tablet (5.6%). Empirical studies have shown that the mobile technology has the most powerful influence on those people who are illiterate or semi-illiterate [13,21]. While the mobile technology is well accepted by the paddy farmers, [2] identified the farmers actually have little understanding on the usage of design icons on the mobile phone. Most of the farmers have a partial understanding on the design icons that they constantly used. The metaphors design is deemed to have a huge potential to improve user

interface design and system usability, which can be adopted in agriculture applications for paddy farmers in Malaysia.

The paper is organized as follows, Section 2 describes the research background, related works and research motivation, in Section 3 presents system requirements and design metaphor guidelines. Next, Section 4 demonstrates the design metaphors on paddy farmer mobile application prototype. Finally, last section provides conclusion remarks.

Background

Theories of Metaphor

Metaphor is a representation of an object and situation that have meaning and comparable to the real thing to convey the message to people. It is conveyed visually through words and images, or through audio or tangible means [12]. Besides, [11], described metaphor as a method for transferring knowledge from a concrete domain to an abstract domain. It also reflects on the mental model of a person that will use the system. Mental model refers of what the user believes about the system at hand and how something works in the real world. According to [21] explained design metaphor consists of two types, which are concrete and abstract metaphor. Concrete metaphor refers to the object and events that are real and solid. It has quite constant meaning for each of the object and events. These types of object or events have senses whereby it can be seen, touch or even smell (e.g. house, machinery etc.). Whereas, abstract metaphor describes as a representation of things that which is common, familiar, as well as can be recognized but the meaning would not stay still and it will keep on changing (e.g. freedom etc,).

Many researches has been conducted in the area of design metaphor and its influence in user interface design and system usability [11,12,21]. The researchers and practitioners still continue to identify and develop effective design metaphors [4,5]. Effective design metaphors could explain abstract or complex concepts, create a sense of familiarity, trigger emotions, draw attention and motivate users to take action. In addition, metaphors can be used in icons as symbols and can also contextualised the user interface and help with immersion and better user understanding.

Related Works

In previous related works [8,10,12], the researchers have discovered the study of design metaphor are more incline of using office metaphors where it encompasses of computer system design metaphor. Usually, these metaphors are related to functions or tasks of the computer system. In addition, the metaphors are designed for those who have high literacy on the computer itself. Based on [5,13,21] it is found out that the semi-illiterate population has difficulty to understand the design metaphors and preferred concrete metaphor rather than abstract metaphor. The study by [24], described users with low-level literacy would favor iconic user interface. The claim supported by many other researchers [8,13,21] that

discovered literacy and computer skills of their users to improve the usability of the system interface using design metaphors.

While studies on design metaphors have been conducted widely in other countries and in their agriculture sector, it is unfortunately not being discovery much in Malaysia. There were only two studies [17,18] which discussed metaphors in Malaysian setting. In [18] the study discussed metaphors involvement in multiracial setting and in [17] the study used to incorporate Islamic metaphors in desktop design for Muslim users in Malaysia. Presently, there are no study design metaphors in Malaysia agriculture context or any study that addresses design metaphors for paddy farmers in Malaysia.

Project Motivation and Overview

This study is motivated by the ICT-Based Agriculture Flagship Blueprint of the Malaysia Government [16]. The blueprint has addressed the government initiative to prepare agriculture stakeholders in Malaysia with ICT knowledge and technology facilities whereby Agro Intelligence System (AIS) [14] is hosted. AIS is a platform to support as well as manage the information on agriculture program that can be accessed on various platform be it mobile devices, personal computer and kiosk [1]. The initiative is targeted for farmers, MoA Agencies, other related agencies and industrial companies. The AIS is comprised of six key applications, which are Farmers Profiling System, Incentive Management System, Market Intelligence System, Agropreneurs Development Management System, Smart Farmers Management System and Transfer of Technology Management System.

Consequently, based on the empirical study in [2], we developed farming diary mobile app for the paddy farmers in Malaysia. The application designed is reflected the farmers' agricultural activities as well as adopted the design metaphor guidelines. The application users are semiliterate paddy farmers that have low- to semi-literacy ICT skills and they have little understanding of the usage of design icon of their mobile phone. In addition, the farmers also are mostly from middle to elderly aged populations and they could only understand and preferred their native language (e.g. Malay language for Malay farmers) rather than English. The research involves three field work studies that took placed in Kuala Selangor, Selangor. Kuala Selangor, Selangor is one of the largest paddy cultivation areas in Malaysia.

The Metaphors Design Guidelines

This section discusses our guidelines of design metaphor for the agriculture domain and subsequently by using paddy agriculture context in Malaysia we developed a set of design metaphors according to the guidelines. The developed design metaphors are going to be used paddy diary mobile app for paddy farmers. The guidelines consist of nine elements: language, activity, instrument, richness, suitability, fun and interesting, originality, adaptability and transferability, finally colour choices. Table 1 describes each of the elements in more details.

Table 1: Design Metaphor Guidelines

Element	Description
Language	• Use language of the population. For example, Malay paddy farmers could only understand Malay instruction, menu, label etc. Icon with textual integration is also not preferable especially if the language could not be understood by them.
Activity	• Represent relevant farming activities. For example, paddy farmers' main activities include sowing, seeds, pesticides spraying, rising water, fertilising, rouging, receding water and harvesting.
Instrument	• Represented relevant farming instruments, machines and appliances. For example, paddy farmers use sickle for roughing activity.
Richness	• Represent the design metaphor with rich source of language, meaning, values, and cultural references. For example, instruments, machinery and appliances use by the paddy farmers in Malaysia are not exactly the same with other countries e.g. India, Indonesia etc.
Suitability	• Design metaphor offers effective solution, functionality and could accommodate for future enhancements. For example, a pictorial of a sack, which was taken from overseas application to indicates sowing seeds activity could not be understood by the local paddy farmers because the icon and functionality does not map properly.
Fun & Interesting	• Metaphor should be understandable and enjoyable. There should be no distraction and frustration feeling towards the design metaphors
Originality	• Metaphor must be real and can relate to the cultural behaviour and representation of specific domain tasks as well as environment.
Adaptability & Transferability	• Metaphor should be flexible and easily adapted in other agriculture domains as well as expanded into other cultural settings.
Colour Choices	• Metaphor colour selection has to reflect the domain theme appropriately. For example, paddy farmers mostly feel comfortable with green and light brown colours interfaces.

Some of the developed design metaphors are discussed. Here, seven design metaphors represent paddy farming activities: sowing seeds activity, spraying pesticides activity, fertilizing, rising water, rouging, receding water and finally harvesting activity is presented to the farmers. Paddy farmers were involved very closely during the design metaphors development process which underwent several refinement iterations. During the initial design harvesting activity icon, many paddy farmers facing some difficulty to understand the design metaphor. Most farmers' mental model relates the harvesting activity with a tractor that has some kind of funnel for extorting harvested paddy as shown in Figure 1. The design metaphor in Figure 2 is illustrated from the spraying pesticides activity. Initially, the icon is designed without a nozzle, but the farmers also have some difficulty in identifying the purpose of the icon. After the design refinement, a nozzle with water spraying out is included.

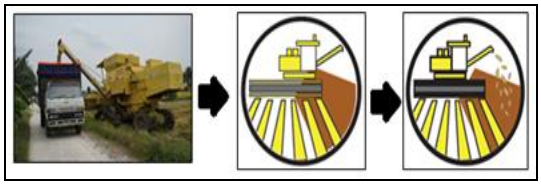


Figure 1: Design metaphor for harvesting

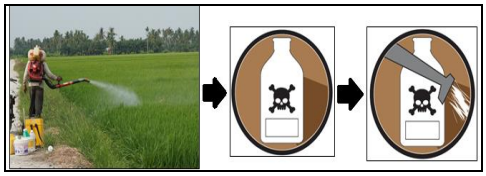


Figure 2: Design metaphor for pesticide spraying

Rouging activity is represented by capturing the concrete representation of sickle and translates this into the design metaphor icon shown in Figure 3. The farmers recognised the rouging activity icon due to its direct map from the real object to the design metaphor. Other design metaphor is developed for fertilizing activity shown in Figure 4. The colour of fertilizer bottle is taken into consideration when designing the icon.

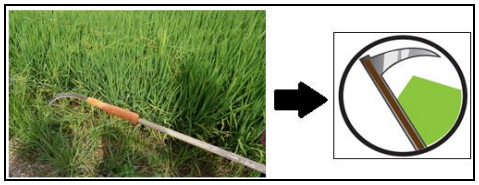


Figure 3: Design metaphor for rouging activity

Figure 4: Design metaphor for fertilizing activity

The design metaphor for 'Karah Daun' illness that would cause brown spots on the paddy leaves is shown in Figure 5. While Figure 6 shows the design metaphor for a pesticide called 'Bena Perang'. This is a common pesticide that attacks the paddy leaves and caused the leaves turn to yellow and dry.

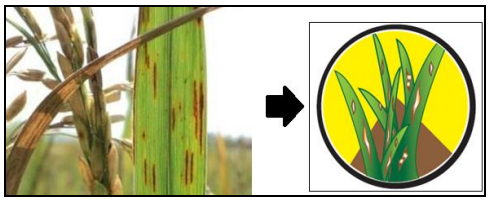


Figure 5: Design metaphor for 'Karah Daun' paddy illness.

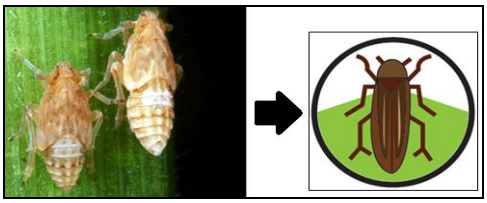


Figure 6: Design metaphor for pesticide 'Bena Perang'.

Figure 7 shows the design metaphor for sowing seeds activity. Most of the farmers could understand the initial design whereby they were able to associate a seed packet on top of paddy-bed. Meanwhile, the design metaphor for rising water activity is shown in Figure 8. Once again the farmers were able to understand the initial design.

Figure 7: Design metaphor for sowing seeds activity.

Figure 8: Design metaphor for rising water activity.

Finally, the design for receding water activity is shown in Figure 9. The metaphor represented by an icon of paddy with less water to indicates lower water level releasing it out from the paddy field. Again, the paddy farmers have no problem to understand the design.

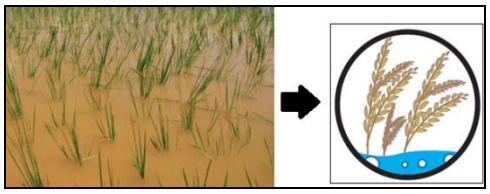


Figure 9: Design metaphor for receding water

The Prototype

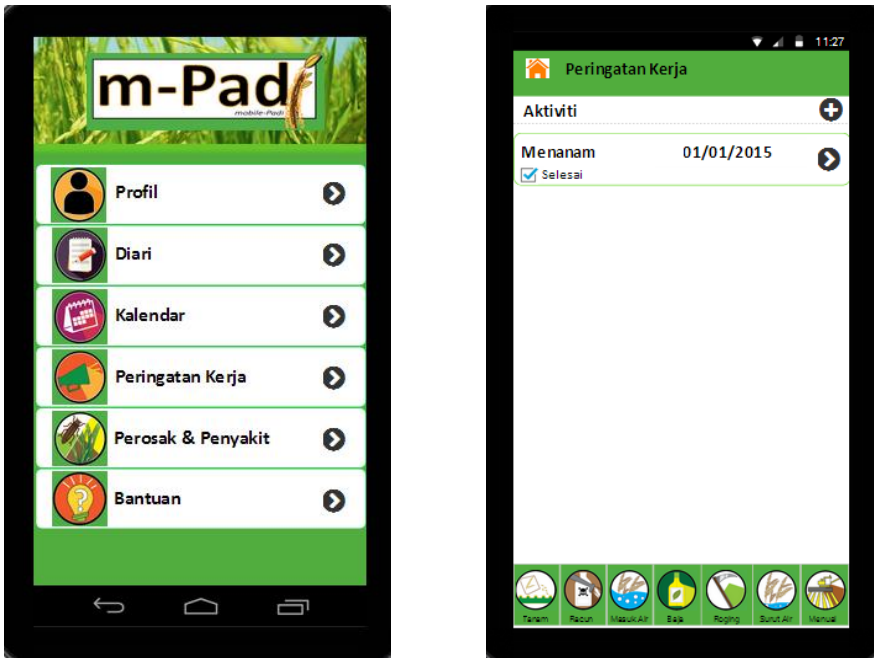
Implementation

A high-fidelity prototype is implemented using Justinmind [9], an authoring tool for designing software prototype. The purpose to develop the high-fidelity prototype is to evaluate the developed paddy diary mobile app that utilised the developed design metaphors. The prototype provides a real simulation to the farmers for the application usage. The prototype is called m-Padi. m-Padi has six main system features: diary, calendar, work reminder, pesticides and illness information, profile and help. Each of the features have different level of requirement priority has shown in Table 2. Figure 10 shows screenshots of the prototype. Finally, the prototype is implemented using Android SDK [3] that works on Android platform environment.

Table 2: System Requirements for Agriculture Domain

Feature	Description	Priority
Diary	• To record paddy farming activities based on season and activities	High
Calendar	• To record details and dates (start and end dates) for specific farming activities.	High
Work reminder	• To record and identify activities that need to be performed during farming seasons and worker who involve/perform the activity.	High
Information on pesticides and crop	• To provide detail descriptions of pesticides and types of illness with pictures.	Medium

Feature	Description	Priority
illness		
Profile	• To record the farmer personal details	Low
Help	• To provide user guide to the farmers	Low



(a) (b)

Figure 10: Screen Interfaces of m-Padi Utilising the Developed Design Metaphors (a) home screen (b) work reminder screen

Evaluation

The usability testing is conducted with a main objective is to ensure the design metaphor proposed in m-Padi app is usable and efficient to use. Four aspects of usability were included in the testing: system usability, appearance of system, metaphor design and overall acceptance. Each of these aspects is tested from the prototype that focuses on usable and free from error. The usability questionnaire is taken from Nielsen [18]. Then, the results were analysed using descriptive statistic method that shows a number of occurrences of each response chosen by the respondents. The data frequency or central tendency (mean median and mode) were measured.

There were 5 paddy farmers involved as the respondent in the usability testing. The usability testing process is held at the food stall nearby the Sungai Sireh, Tanjung Karang. The food stall is owned by one of the paddy Head Block and all information has been recorded using a camera. Usability task scenarios were prepared in advance and given to the farmers during the testing. The app is demonstrated to them using Android platform mobile.

The farmers were required to follow the instruction given to them from the task scenarios and keyed-in certain required information.

The overall mean of system usability construct was 1.62 (SD=0.428). Thus, it indicates most of the respondents agreed the system is usable and free of error. The respondents also agreed on the usability aspects stated in the study that consists of effectiveness, efficiency and satisfaction. The mean value for system appearance is 1.34 (SD = 0.217). It can be concluded that most respondents are agreed with the appearance of the system. The respondents have agreed on the choices of colour, screen navigation, organization of the buttons and interface of the system is pleasant. For metaphor design evaluation, the overall mean value is 1.50 (SD = 0.265). According to the mean value, it indicates that the respondents agreed with the developed design metaphor which is easy to understand, represents specific paddy farming activity, colour choices of the design metaphor is appealing, the design metaphor is suitable and the design metaphor is easy to use. For the overall acceptance, the mean value obtained is 1.60 (SD = 0.354). It shows that majority of the respondents have accepted the design metaphors as well as the mobile application. Finally, the respondents have agreed that they would be likely using the application in the future. In addition, they strongly agreed that they satisfied with the ease of the application and could complete tasks in a reasonable amount of time.

Conclusion

The paper has described a study to investigate the effectiveness of current existing design metaphors to support usability for paddy farmer population in Malaysia who live in rural areas using user-centered design approach. User-centered approach that relies on users' involvement throughout the design process could lead to an accurate design decision that users will find useful and want to use the system. The crucial part of this work is to elicit the requirements that user required for specific functions and needs. Deeper understandings gained are used to derive a set of requirements of metaphors designs that address the local farmers' characteristics e.g. literacy, ICT skills, experience, language, culture, tasks and instrument, adaptability.

Design metaphors that match well could improve user interface design while minimizing intervention for the farmers using agriculture application systems that are introduced to them. The study also intends to use the design metaphor guidelines to develop a set of design metaphors which going to be adopted on appropriate application contexts for the paddy farmers i.e. paddy diary. Then, to find out comprehension level of paddy farmers population after using the design metaphors of the agriculture application. The results from the work are expected to assists software developers and designers to design effective design metaphors for the intended population e.g. farmers/paddy farmers in Malaysia.

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Agricultural Extension Services for Agriculture Risk Management through ICTs in Malaysia

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Agriculture Extension is considered as a major development partner in the agriculture development process. Extension services are rendered to help the farmers in different dimensions for the smooth flow of agricultural activities. As the current scenario has breeds many problems in the agriculture management process, so potential of ICTs have been attracted into this sensitive discipline. In this regard, an empirical study was conducted in four nature sensitive areas of Malaysia to assess the extension services dispensed for agriculture risk management keeping in view the digital technologies by the field staff. There were 360 farmers selected through stratified random sampling technique. The results reveal that visits paid by extension staff were mostly on annual or bi annual basis as reported by most of the farmers. Farmers reported that they got information from extension staff about use of ICTs for disaster information which is still less than required. Still most of the farmers felt that they were failed to get support from extension field staff to integrate ICTs for proper management of agriculture risks. Farmers also highlighted that extension staff knowledge is not at par so they need improvement. Thus, it can be inferred that public and private sector should initiate various training programmes firstly for the staff and then diffuse various management skills and techniques into farmer fields for better agriculture risk management and also incorporate the digital essence through ICTs. Frequency of visits may also require to be improved for effective technology transfer. As a result, not only socio-economic condition of farmers would be improved but also challenges like climate change can be handled.

Keywords: Agricultural extension, agriculture risk management, ICTs, Malaysia

Agricultural extension services are challenging particularly in the current scenario when climate changes are affecting farms and farmers in various dimensions. The dilemma is that the service providers are not yet fully sensitized and equipped with techniques which can offer quick solutions with minimum cost. Most of the services have been focused on agriculture technology transfer but less has been emphasized on risk management by the application of Information and Communication Technologies (ICTs) side. As day by day farmers have to face different problems dissimilar to the past so, there is a need to opt digital options for quick solutions and making this sector sustainable. Extension services providers can motivate the farming community to use available digital options for minimizing the risks associated with agriculture sector. These risks can be related with production, price, market, technology, legal, health, and personal (Baharuddin, 2012). Risk in agriculture sector is related with various factors which leave negative impacts originated from different variables

like natural, biological, climatic and input and output prices (Jain and Parshad,2007; Agwe and Azeb, 2009; AIT/UNEP, 2010).

According to Baharuddin (2007), apart from blessed natural landscape with numerous resources in Malaysia, natural disasters like floods, droughts and land sliding are creating adverse effects on the agriculture sector. In Malaysia, the flood prone area is nearly 9% of the land area (2.97 million ha). In fact, agriculture sector needs more attention of public, private, NGOs and development sector as more problems are emerging with the passage of time. In this regard, extension as a central player has to accelerate the pace for addressing issues for the farmers and with the farmers. Baig and Aldosari (2013) also mentioned that in Asian countries, there is a need to reconsider extension system in the present scenario as there are many challenges emerging.

In this era of digital technologies, not only extension personnel but also farmers are naturally getting interest and attention to use ICTs in the agriculture sector. It is due to the fact that are already using for social interaction. However, farmers are not well informed and equipped with the benefits hidden in the ICTs which can be harnessed for keeping them more informed about weather forecasts, agricultural best practices, innovations in agriculture sector and many more. Indeed, various ICTs are getting attention of various development sectors in various states of Malaysia. However, digital based agriculture sector is less focused due to lack of awareness and knowledge about its potential role in the management of agriculture risks. Baig & Aldosari (2013) along with other authors (APO, 2002; FAO, 2004; Anandajayasekeram et al., 2008) have pointed out that existing extension methods (traditional) like individual, group and mass contact methods need to be grafted with ICTs for making the information available to all players in an efficient, quick and effective manner (FAO, 2004). Ultimately, it would give boost to the traditional extension system.

Methodology

The research was conducted in four areas of Malaysia affected by disasters or perceived to be prone to natural catastrophes. The 350 farmers were randomly selected and interviewed face to face with the help of local enumerators. The enumerators were trained before final execution in order to avoid any field hurdle. The pre designed questionnaire was used as a data collection tool. Moreover, Statistical Package for Social Sciences (SPSS) was used in the analysis of data.

Results and Discussion

Information acts like power and also empowers the farmers which can ultimately help in the action and reaction (decision). According to Demiryyurek et al (2008) one of the important factors in agriculture is information which helps the farmer in the better management of agriculture and also facilitate in the better decision process when provided by extension service providers, research, academia and agricultural organizations. In fact, it makes the

farmer more knowledgeable and also inhibit in taking wrong decisions. Mittal and Mehar (2013) conducted a survey in Indo-Gangetic plains of India to assess the agricultural information networks and needs of farmers along with risk management strategies and found that farmers had multiple sources of information and did not rely on single source but, on the basis of information accessibility, precision and Trustworthiness.

Farmers use single or various sources regarding weather forecasts for appropriate management of agriculture risks. In this regard, results of empirical research depict that television and fellow farmers were the main sources of information as revealed by 79.4% and 61% of the farmers. The results are consistent with Ngathou et. al. (2006) who conducted research in Northa Alabama to explore sources of information by limited resource farmers and found that information received by face to face contact and through television programmes are most useful methods. Almost 40% of farmers said opinion leaders are their main source of information. Similarly, radio and newspapers were also sources of information as reported by 37.2% and 35.3% of the farmers. Almost similar percentage of farmers highlighted Department of Meteorology and Department of Agriculture as their information pool pertaining to weather updates. Regardless to these sources, self-judgment was perceived effective by more than slightly half of the research population. Moreover, state authority was least significant as a source of weather information as only 2.2% farmers were able to obtain relevant information. There were only five farmers who said that they did not have any information at all while, only 1.9% of the farmers told that they had other sources of information like trade dealers, relatives etc.

Thus, it is clear from the Table 1, that television, fellow farmers and self-judgment were better sources of weather information for the management of agriculture risks in the lens of farming community in the research area. The links with fellow farmers in terms of agriculture sector development can never be ignored as these links facilitate farmer to farmer interaction and mirror the snowball effect. This effect ensures that most of the farmers access each other and get informed about any update because inter communication is supposed to be good and cheap solution for majority of the farmers.

It is an important point to mention here that most of the farmers waste their precious time to gather the information, judging the credibility, reliability and matching with own needs which some time lead to delay in the decision and final action. Moreover, type and nature of risk, time, technology, information source (s) and decision making ability are important factors for the farmers. So, rapid digital technologies (ICTs) and extension service providers either public or private might help the farmers in taking the decision. Similarly, farmers can also confirm the consequences of their decision through discussion with extension experts and also results of other farmers through ICTs.

Table 1: Sources of Information about Weather Forecast

Sources	Frequency	Percentage	Rank
Radio	134	37.2	5
Television	286	79.4	1
Department of Fisheries	05	1.4	13
Department of Veterinary Sciences	15	4.2	9
Fellow farmers	220	61.1	2
Opinion leaders	146	40.6	4
Newspapers	127	35.3	6
Department of Meteorology	39	10.8	7
Telecommunication Company	07	1.9	11
Department of Agriculture	38	10.6	8
Self-judgment	187	51.9	3
State authority	08	2.2	10
No information	05	1.4	14
Any other	07	1.9	12

Extension workers in their areas of jurisdiction play a vital role in the agricultural development. They meet farmers face to face or contact indirectly in order to sort out best fit actions need to be taken by farmers. In this regard, their frequency of meeting with farmers differs from country to country and even within country area to area. FAO (2005) highlighted that extension officers are important frontline workers as they visit farm of the farmers for links establishment, motivation, and detections of problems being faced.

The results of the study displayed in Table 2, reveal that extension staff met farmers on annually (30.9%), biannually (28.6%) or never (23.9%). On the other hand, approximately 4% of farmers were visited by extension staff on weekly basis followed by fortnightly (3.1%) and slightly more than 10% of the farmers opined monthly basis. Phetsamone (2012) conducted a study in Laos to evaluate the role of agricultural extension services on rice production efficiency and found that 26% of the surveyed farmers did not have access to extension services.

Table 2: Frequency of Agriculture Extension Staff Visits

Frequency of visits	Frequency	Percentage
Weekly	14	3.9
Fortnightly	11	3.1
Monthly	38	10.6
Bi annually	103	28.6
Annually	108	30.9
Never	86	23.9
Total	**360**	**100.00**

Farming community needs help of the extension experts most of the time in the agriculture sector. They not only inform farmers to adopt new technologies but also support in grafting of new ideas into their existence agricultural practices. Kristin et al. (2014) pointed out that there is a need to change the existing traditional role of extension into new dimensions of support services which must help in variety of emerging challenges like malnutrition, risk and disaster preparation, adaptation to climate variations and resilience of farmers. In this regard, farmers were asked to respond about extent of support being provided by extension staff to integrate ICTs for agriculture risk management. The results indicate (Table, 3) that 36.1% of the farmers expressed adequate support obtained from extension experts. While 22.5% of farmers negated any kind of support. Similarly, 18.9% of the farmers said minimal support, 11.9% of farmers assumed some support and only 10.6% of the farmers believed that extension staff was very supportive in not only bringing attention of farmers but also helping them in the integration of digital technologies for agriculture risk management.

Overall, the results disclosed that farmers had mixed feelings in the support being extended to farmers. It can be due to the fact that, extension staff might not be well equipped and trained in drawing the attention of farmers. So, if extension staff is already trained then these digital innovations in the agriculture risk management would be easy. Lastly, Extension officers have to be fully supportive particularly in the areas where farmers are more prone to natural catastrophes.

Table 3: Support by Extension Officers

Support	Frequency	Percentage
No support	81	22.5
Minimal support	68	18.9
Some support	43	11.9
Adequate support	130	36.1
Very supportive	38	10.6
Total	**360**	**100.00**

Farmers try to receive as much as information especially in the risk management field and their areas. Indeed, it is a common perception that extension staff is well trained and better informed in the variety of issues in agriculture sector. Farmers were asked about information

they have received from agriculture extension staff about various uses of ICTs in the management of agriculture risks. The empirical results given in Table 4, demonstrate that 33.3% of the farmers responded that they received information about use of ICTs for disaster prevention. While, 27.2% of the farmers said that extension officers informed them about use of ICTs for well preparation in case of any disaster occurrence. Moreover, 22.2% of farmers acknowledged that extension specialists facilitated the farmers in the ICT usage for pre and post recovery. In addition, there were 23.1% farmers who replied that extension workers brought into their notice about use of digital means for knowing about market price condition during disasters. There were 38.6% of the farmers who highlighted any other as information given by extension personnel like pest and diseases, health related issues, destruction of physical infrastructure, food shortage, shifting to secure places, public and private services for disaster victims, relocation of livestock, volunteers, emergency medical services and government polices etc.

Therefore, it can be gathered that farmers receive variety of information from extension field staff before, during and post disasters for agriculture risk management by the use of ICTs. However, still there are many farmers who remained uninformed about sudden natural disasters which might lead them towards losing interest in the agriculture sector. Thus, if all the farmers are well informed and prepared in advance to tackle any natural disaster by the help of ICTs then risk management in agriculture can also be ensured to some extent. Efforts of extension field staff are being desperately needed in this regard.

Table 4: Information about Use of ICTs from Officers

Items	Frequency	Percentage
Use of ICT for market prices	83	23.1
ICT for disasters information	120	33.3
ICT for relocation in case of emergency	55	15.3
ICT for well preparedness in any disaster	98	27.2
ICT for pre and post recovery	80	22.2
Any other	139	38.6

The intensity of risk many be even higher when service providers either do not help farmers at appropriate time or lack ability to transfer innovative risk management techniques in the agriculture sector. Extension staff knowledge does count when transferring innovative and ICT based risk management technologies to the farmers. In this regard, farmers were asked about their assessment regarding extension staff knowledge in agriculture risk management through the use of ICTs. So, the results demonstrate that (as displayed in the Table 5) 38.6% of farmers opined that extension staff of public and private sector needs improvement. Whereas, 11.4% of farmers pronounced knowledge of extension staff as weak and 12.2% evaluated as fair. However, 26.9% of the farmers viewed knowledge level as good and 10.8% rated as excellent.

As a matter of fact, when extension staff is experienced, well informed, updated, already received many related trainings and their knowledge benefited many farmers then farmers

would be satisfied. It might be a plus point when extension workers have continuous contact with farmers then extension staff might be ranked good or excellent in their knowledge.

Table 5: Extension Staff Knowledge

Extension Staff Knowledge	Frequency	Percentage
Needs improvement	139	38.6
Weak	41	11.4
Fair	44	12.2
Good	97	26.9
Excellent	39	10.8
Total	**360**	**100.00**

Conclusion

It can be concluded that agricultural extension services need to be overhauled on urgent basis with continual up gradation. All the stakeholders must pay attention and sensitize their field staff regarding agriculture risk management and ICTs. Frequent visits, skills and knowledge up gradation through training programmes on regular basis, farmer friendly support and policy particularly at the time of disasters and help for resource poor farmers are required in Malaysia generally and disaster prone areas particularly.

Recommendations

In order to reach majority of disaster prone farmers, extension service providers need to be fully aware, equipped and empowered themselves in all aspects so that they can easily help the farmers in resilience. Moreover, the services should be triggered for poor resilient farmers and must not be ignored. There is a need to establish separate section in the public and private extension system, allocate more financial and other resources in the disaster prone areas, develop methods and strategies to integrate ICTs with the help of farmers by involving all the game players. Moreover, extension service providers' role and duties should be redefined according to the challenges, risk management and ICTs related skills should also be grafted and link among extension, research, academia and farmers must be strengthened.

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Perceived Self-Efficacy Level And ICTs Preference Of Fishermen for Flood Risks Advisory Services In Terrenganu State, Malaysia

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The effect of climate change is known to undermine livelihoods especially the agricultural based livelihoods along the coasts regions of nations. Weather extreme events like flood, draught, tsunamis and earthquakes are the resultant effect of climate change. ICTs are utilized in the process of monitoring, mitigation and risk reduction of these weather related extreme events. In Malaysia where the ICTs are ubiquitous and with an impressive access across the population, the flood risks reduction exercise is heavily bridged upon ICTs. The effect of this ICTs mediated advisory service to the fishermen psychological state like level of self-efficacy and motivation to be prepared to flood events is however scarcely researched. The research therefore looked at the psychological effect of climate change, weather and flood risks communication on self-efficacy of fishermen in Setiu, Besut, Kuala Utara and Merang fishing districts of Terengganu state, Malaysia. A random selection of four districts was made out of the seven listed fishing districts in the state. 125 respondents were randomly selected across the selected fishing districts. They were administered questionnaires. Data obtained was analysed using descriptive statistics of frequencies and percentages. The findings revealed the common types of ICTs used for the dissemination of flood risk information as Radio, Television, SMS and Social Media. The most preferred medium for weather and fishing advisory services was Television. However, for flood risk advisory service the fishermen indicates that the most preferred ICTs are the Social Media, followed by SMS. Majority believes that the weather and flood risks reduction Advisory service has lifted their self-efficacy to moderate level and hence motivation to be prepared. The research was able to determine preferred ICTs medium for specific tasks for weather, fishing and flood risks reduction advisory services. It also determine the influence on perceived self-efficacy and therefore recommended that in designing communication models and programs, the use of preferred ICTs be made while enriching the content and approach to improve the psychological state and therefore self-efficacy, attitude and motivation of the fishermen and target groups to be prepared for reduce risks of flood and weather extreme events.

Keywords: Self-efficacy, ICTs, Flood risks, early warning and agricultural livelihood

Introduction

The climate, environment and natural disaster are linked trios that are critical to the lives, livelihood and agricultural practices of man. While climate and environment support life, the agricultural production and other livelihood activities, technological advancement and other activities of man has tempered the environment. Directly impacting on the climate and weather, making it anything but stable and or predictable. Hence, the attendant disasters like tsunamis, hurricanes and floods that are destructive and devastating to man and his livelihood.

The challenges of climate change has thrust the agricultural extension with a new responsibility of understanding the developmental approach to vulnerable communities of agricultural livelihoods (Heeks & Ospina, 2015). The profession being a medium of knowledge transfer and other services finds ICTs as useful, convenient and veritable tools for developmental communications. Also, a cost effective means of collecting, storing, processing and communicating disaster and risk information in agriculture (Chikaire, Ani, Atoma and 2015; Lio & Liu, 2006).

Sectoral analysis of the effect of climate change and resultant disasters reveals a direct hit on the agricultural sector. Enterprises like Fisheries which are recognized among core contributors to poverty reduction strategies and a main source of protein supplies in developing countries are among the worst hit. This is due to their constant association with water bodies, which are considered highly at risk of weather extreme events like flood (Food and Agriculture Organization, 2007).

Flood incidence is recurrent and rapidly increasing in the world (Cavallo & Ireland, 2014; Chan, 2015) and is the main natural disaster in Malaysia (Department of Irrigation and Drainages, 2009). Flood and other natural disasters caused by extreme events of weather have proven to be counter development and exacerbating food insecurity, undermining sustainability of livelihoods of especially developing countries. (FAO, 2013; Tamara, Baas and Alvarez, 2013). The fishing communities in Malaysia and particularly of Kelantan, Terengganu, and Pahang have been the main areas affected by flood incessantly in Malaysia (Fizri , Abdul Rahim & Koshy, 2014; Hua, 2015; Khalid & Shafiai, 2015; Ahmad & Abdurahman, 2015; Jamaludin, Deni, & Jemain, 2010) due to their location facing the northeast monsoon. Reportedly the most affected are the people that socio-economic activities depend on weather and climate (Suhaila, Deni, Zin, & Jemain, 2010) these are the farmers, fishermen and traders among others.

The effort of the world to reduce risks of these natural disasters is seen to be heavily bridged upon the ICTs. They are recognized as efficient trajectories for socio-cultural development (World Economic Forum, 2015). Malaysia is endowed with both ICTs and Flood events, while the challenge of flood is incessant the spread of ICTs is also ubiquitous in the country. With a broadband coverage of above sixty percent penetration (WEF, 2015) and utilization

rate of above 98 percent for phone and 76 percent for internet by people aged 15 and above (Department Of Statistics Malaysia, 2016). Malaysia can be said to be having robust ICTs with close to non-existent digital divide in term of access.

Various forms of ICTs are used by agencies to disseminate information about early warning and safety measures to the flood prone areas inhabitant. This is to increase awareness level and reduce risks to lives and properties. The information is supposed to improve the knowledge level, self-efficacy and therefore preparedness of the fishermen. However, there are suggestive low preparedness to flood in this areas (Khalid et al., 2015; Khalid & Shafiai, 2015).

Since preparedness is behaviour, and self-efficacy of an individual is among key psychological state that determines behaviour change, the need to assess the fishermen self-efficacy as a result of these information is essential. This will reveal the stage of their self-efficacy and whether the Department Of Fisheries, National Security Office and other agencies that are concerned with disaster risks reduction are effective in reducing flood risks in the country. Terengganu was especially focused because of its vulnerability and a reflective of the seeming reduced fishing activities in the area. For example a reduction in number of registered fishermen from 2013 (11,382) to 2015 (10,489) (Department of Fisheries Malaysia, 2015), perhaps, it may be the effect of flood and low level of confidence in survival in the flood prone areas.

Flood risks and its effect on fisheries and food security in Malaysia

Climate change and its resultant events are a major source of systematic risks for farmers and rural communities (Lotsch et al., 2010). The likelihood of flood affecting the densely populated coastal areas of South, East and south East Asia is higher due to heavy precipitation and in some mega deltas from over flowing rivers (Keating et al., 2014; FAO, 2013).

Agricultural livelihood are known to be seriously affected by events like floods (Hamdan, Man, Md Yassin, D'Silva, & Mohamed Shaffril, 2013), this disruption has a direct negative effect on the food supply of countries. According to the FAO poverty reduction and hunger alleviation are directly threatened by climate change (FAO, 2015; FAO, 2013). Achieving food security and reducing poverty is thus absolutely dependent upon how well and successful DRR is. This is because whatever is done to address these vicious duo, are easily wiped out by the disasters. Furthermore when disaster strikes its ripple effect are numerous for example it cut off the fishing communities from markets, blocks food supplies to cities hence the incomes and livelihood of producers are greatly affected. In addition health issues like trauma, disease breakdown etc. sets in if not adequately addressed.

In Malaysia flood is fortunately estimated to bring about moderate to small effect on the agricultural sector (Hamdan et al., 2013). However, the country has had devastating experience from flood. In 2007 a recorded loss of 29 lives was reported and about 166,000 people affected (Dahlan, Dahan, & Saman, 2013). Economic damage was reported to amount

to about USD 968 million (Dahlan et al., 2013). In the year 2014 the agriculture and agro based industry minister Datuk Yaacob was quoted in Inquirer newspaper as saying the flood of December, 2014 cost the agriculture sector in Kelantan RM 1 billion in losses, affecting 119,000 small holder farmers , 69,000 rubber plantation, 50,000 oil palm farmers, 150 animal farmers and destroying 11,099 hectares of agricultural land (Inquirer, 2015).

Contribution of fishing industries to Malaysia

Fishing is one important agricultural practice that is significant to Malaysia in terms of livelihood, food security and aesthetics (tourism) to a lot of the population and tourists alike. It was reported that in 2009 more than 125,000 people drive their livelihood from fishing (Bt Ramli, Omar, Bolong, D'Silva, & Shaffril, 2013; Shaffril & Hassan, 2012) and in 2005 it add about RM 4 billion (about 1.3 billion USD) to government coffers (Shaffril & Hassan, 2012) this is expected to have risen significantly over the years. However, the population of fishermen in developing nations are identified at an especially greater risk because of little access to infrastructure and non-inclusiveness in decision making (FAO, 2015). A counter development, anti-agricultural practice and regrettable reality that is ever increasing in frequency, magnitude and severity (Cavallo & Ireland, 2014; IPCC, 2007; Watkins, 2007).

ICTs facilitative role for collaboration in Disaster management in Malaysia

The fact that disaster Management is continuous and highly requiring collaborative exercise in which data generated by an organization might be useful to several others and vice versa. This therefore underscore the need for efficient generation, organization and distribution of data, which ICTs are identified as being efficient (Dahlan et al., 2013; Muktar, Man, & Jega, 2016; Sagun, 2010).

Malaysia is a subscriber of the Adaptation Knowledge Platform (AKP) for the fight and mitigation of Disaster risk reduction (DRR). The AKP is developed for Asian countries as a response for the need of an effective means of information sharing on climate change adaptation and increasing adaptive capacities (Solar, 2011). It is expected to foster the connectivity among all stakeholder, managing advocacy for collective action on climate change and response while searching for fund and research opportunities and knowledge together, creating a flow of all efforts and information across the different actors within the DRR cycle in the country (Solar, 2011).

The AKP is heavily serviced by the ICTs, it can be said ICTs are the livewire of the platform since most of the data transferred across stakeholders enjoys the benevolence of the technology. Since ICTs are being used and provide an easier route to the need for a participatory and inclusiveness in developmental effort of a population (Muktar et al., 2016). There is a need to identify the preference of ICTs type by the fishermen and the perceived effect it has on their self-efficacy. Therefore the objective is to

i. Identify the type and preference of the ICTs type by the fishermen for flood risk reduction and fishing activities.
ii. Describe the perceived effect of flood risk reduction information on their self-efficacy

Methodology

The study area is Terengganu state which was randomly selected among the East Coast state that are disturbed by incessant flood. The state has an area of 12,974 Km^2 , an estimated population of 1.18 million people in 2016 (DEPARTMENT OF STATISTICS MALAYSIA, 2017) amongst which are registered fishermen of about 10,489 (Department of Fisheries Malaysia, 2015).

The study areas are fishing districts randomly selected in Terengganu State. They includes Merang (33), Setiu (30), Besut (32), Kuala Terengganu Utara (30) which form four out of the total seven fisheries districts areas of the state. A randomly selected population of thirty fishermen in Setiu and Kuala Terengganu Utara while Merang and Besut has 33 fishermen each, however one questionnaire was invalidated by wrong filling. This brings the total number of fishermen to be 125. Data collected was analysed using descriptive statistics of percentages and frequencies.

Results and Discussion

The result in Table 1 shows that majority of the fishermen are within the age category of 48-57 years of age, this shows an aging population of the fishermen in the state. Its implication will be that the profession may be challenged in meeting its demand and also challenge of succession since the younger generation has little interest. However, the next majority are within the age bracket of 34-47 and a cumulative sum with the age group of 19-33 reveals that, they are the overall majority with a cumulative percentage of 52.8 percent. Malay ethnicity is the major group, largely due to high concentration of the ethnic group in the state.

A male dominated profession with only 1.6 percent female, with most of the fishermen being married (83.2%). The income level is mainly around the categories that earn between RM 801-1400 with about 52%. This figure is below the Malaysian minimum wage of RM 1800. This shows a low living standard since this income reflects the total household earning and hence larger households may live below the benchmark of $2 per day.

Table 1: Socio-economic characteristics of fishermen in Terengganu state, Malaysia

Variables	Frequency	Percentage
Age Categories		
19-33	35	28.0
34-47	31	24.8
48-61	44	35.2
62-75	15	12.0

Ethnicity		
Malay	118	94.4
Chinese	7	5.6
Gender		
Male	2	1.6
Female	123	98.4
Marital Status		
Single	19	15.2
Married	104	83.2
Widowed	1	.8
Divorced	1	.8
Fishing experience		
2-16 years	61	48.8
17-29 Years	20	16.0
30-44 years	34	27.2
45-59 years	10	8.0
Income		
RM 200-800	47	37.6
RM 801-1400	65	52.0
RM 1401-2000	13	10.4

Source: Field Survey, 2016

Table 2 shows the preference of ICTs type for accessing weather and fishing advisory services. The preference was ranked on each question asked on ICTs type, this was ranked based on the number of percentages. The most preferred according to the percentage is TV (83.2%), then 2nd was Radio (80.8%) and 3rd was Social Media with (65.6%). This shows that the three are the most preferred ICTs however on different level. TV is seen to be highest and may be related to the fact that was discovered during FGD where the fishermen have a culture of watching TV in groups, whenever they are not on sea.

Table 2: Fishermen's ICTs Preference for weather and fishing advisory services

Preferences	Frequency	Percentages	Ranking of Preference
TV	104	83.2	1st
Radio	101	80.8	2nd
Social Media	82	65.6	3rd

Total	125	100

Source: Field Survey, 2016

Table 3 shows the preference of fishermen on the type of ICTs for flood risk communication. Respondents were asked whether they prefer a particular type of ICTs by indicating either preferred or not preferred. In all, most of the respondents (84%) selected social media to be the most for flood risks advisory services. While (75.2%) selected mobile phone to be the preferred while TV and radio were selected by 69.6% each by the total respondents. The ranking came as Social media to be 1st most preferred based on the highest percentage of (84%) and Mobile phone is 2nd and TV and Radio are 3rd having the same percentage score. This corroborate assertion of (Bolarinwa & Oyeyinka, 2011) that suggest use of mobile phone will adequately and efficiently serve beneficiaries to receive advisory services.

Table 3: Fishermen's ICTs Preference for flood risk advisory services

Preferences	Frequency	Percentages	Rank
Social Media			
Preferred	105	84.0	1st
Not preferred	20	16.0	
Mobile Phone			
Preferred	94	75.2	2nd
Not preferred	31	24.8	
Radio			
Preferred	87	69.6	3rd
Not preferred	38	30.4	
Television			
Preferred	87	69.6	3rd
Not preferred	38	30.4	
Total	125	100.0	

Source: Field Survey, 2016

Table 4 reveals the preferred ICTs by the fishermen for the issuance of flood risks advisory communication. The most preferred medium was indicated to be through Radio with (87.2 %) response, followed by TV with (79.8 %) then followed by social media with (76.8%) and then mobile phone with (71.2%) responses. This finding may be for the fact that the mobile phone is always accessible and information can be sent and received in real time, especially through SMS which doesn't requires data or internet. Hence a convenient, efficient and effective medium for risks and other advisory services (Meng, Omar, Bolong, D Silva & Shafrill , 2014; Muktar et al., 2016).

Table 4: Ranking of ICTs being used for flood risk advisory services in fishing districts

Souce: Field Survey, 2016

Variables	Frequency	Percentage	Ranking
Radio	109	87.2	**1st**
Television	99	79.8	**2nd**
Social media (Facebook and Whatssapp)	96	76.8	**3rd**
Mobile Phone(SMS)	89	71.2	**4th**

Table 5: Shows the self-rating of the fishermen on the general self-efficacy scales. It indicates their perceived ratings on their ability to act and minimize risk of flood as a result of ICTs access and information accessed through them. Generally, the question that has the highest level of disagreement is "I feel prepared and confident to save myself and family in the event of flood and unfavorable weather events, because I usually is informed beforehand through ICTs" with strongly disagreement (29.6%) and disagree of (28.0%). This suggest that either the advisory service is not effective or the content doesn't have enough encouraging and motivating message in it. This may be as a result of the general mindset of people that have confidence on their government flood and wildfire incidence, as described in Malaysia, USA and Netherlands, where people were asserted to be relaxed and absolutely rely on the government to solve their flood problems (Khalid & Shafiai, 2015; Martin, Bender, & Raish, 2007; Martin, Bender & Reish, 2007; Oladele, 2013).

For most of the questions the majority fall between strongly agree and agree level, question like "I can always manage to solve problems of flood risk because of flood risk advisory information I accessed through ICTs" having (52%) agree and (9.6%) strongly agree rating. "If faced by flood I can get access to help through use of mobile phone or social media" having (35.2%) agree and (24.0%) strongly agree rating. Indicating that the advisory services received through ICTs has giving them some tips on problem solving. Many researchers have found ICTs to be well utilized and were found to have different effect on fishermen and their socialization (Mazuki, Omar, Bolong, Dsilva, Hassan and Shafril, 2013)

Table 5: Self rating of by fishermen on general self-efficacy scales

Self-efficacy scales	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree	Total
I can always manage to solve problems of flood risk because of flood risk advisory information I accessed through ICTs	10.4	18.4	9.6	52.0	9.6	100.0
If faced by flood I can get access to help through use of mobile phone or social media	12.8	15.2	12.8	35.2	24.0	100.0
I can confidently deal with flood and other risks due to wealth of information I accessed through ICTs	16.8	28.8	28.0	12.8	13.6	100.0
Thanks to my use of ICTs as a result I am resourceful and confident in managing flood events to save myself and family	19.2	25.6	28.0	16.8	10.4	100.0
I can save most of my properties and family if I invest in preparedness to flood	14.4	24.0	16.0	31.2	14.4	100.0
I can remain calm and focused during flood because of my coping	27.2	31.2	9.6	17.6	14.4	100.0

abilities						
When I am faced with challenges of flood that I can handle I can access help through my community or authorities using mobile phone	23.2	28.0	12.8	19.2	16.8	100.0
When flood came I can usually think of many rescue solution and access them through mobile phone	15.2	34.4	8.8	28.0	13.6	100.0
Usually I am capable of handling whatever challenge comes my way including flood	24.0	32.0	11.2	15.2	17.6	100.0
I feel prepared and confident to save myself and family in the event of flood and unfavorable weather events, because I usually is informed beforehand through ICTs	29.6	28.0	19.2	12.8	10.4	100.0

Source: Field Survey, 2016

Table 6 shows the level of perceived self-efficacy influenced by ICTs mediated advisory service on the fishermen. Majority (60.0 %) indicated that the communication has had a moderate effect on their self-efficacy, while (20.0%) indicated the effect was high and only (20.0 %) feels the effect was low. This result shows a fair influence on majority of fishermen's self-efficacy, however the desired level that all the fishermen should be is high and therefore a lot need to be done to push them up to the highest level. As the higher their self-efficacy level the more likely for them to have good preparedness level. The result agrees with an assertion in a research on ICTs use in microenterprises, were it was asserted that use of ICTs to access information can boost business skills as well as personal attributes like self-efficacy and motivation (Duncombe, 2007).

Table 6: Perceived effect of ICTs mediated advisory services on self-efficacy of fishermen

Self-efficacy perceived level	Frequency	Percentage
Low	25	20.0
Medium	75	60.0
High	25	20.0
TOTAL	125	100.0

Source: Field Survey, 2016

Conclusion

The research found out that the common ICTs used for the dissemination of flood risk advisory services to the fishermen are Radio, Television, SMS and Social Media. The most preferred medium for weather and fishing activities is indicated to be Television, however for the flood risk advisory services the fishermen indicate that the most preferred ICTs for the issuance of early warning is the Social Media, followed by SMS. For the self-efficacy the majority believes that the weather information and flood risks reduction awareness has lifted their self-efficacy to moderate and hence motivation to be prepared to the incidence of flood. This reveals the expressed perception of the fishermen preference and effect on their self-efficacy. The preferred ICTs can therefore be used to offer advisory and extension services and it should be fortified with enough motivational laden messages to the fishermen for effective and behavioural change communication.

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Livestock Management Information System

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Livestock Management Information System (Livestock MIS) is an electronic information system which allows users to manage their livestock. The main purpose of this system is to increase and optimize livestock management to a new level, especially in Malaysia. Most farmers in Malaysia opt to use the traditional way of managing livestock which involves paper filing. This method is inefficient as it requires more time and effort to accomplish tasks. Besides that, farmers also have difficulty to create report as reports need data to be calculated and analyzed. Among the common reports produced are milk production analysis, health analysis and vaccination reports. Besides that farmers also need to calculate feed formulation for the livestock and its expected carcass. All of these tasks are tedious. Thus, the Livestock MIS is proposed to ease farmers in terms of managing and monitoring their livestock. It is aimed that the emergence of the Livestock MIS will revolutionize the way farmers managing livestock and will increase the productivity. The system development methodology used to develop this system was Rapid Application Development (RAD).

Keywords: livestock, information system, farmers

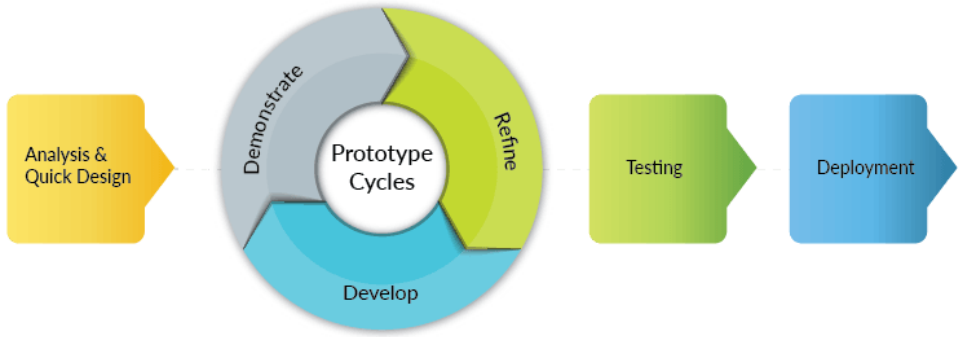
The livestock industry is one of the most important drivers of the agriculture industry in Malaysia. However, farmers especially small to medium scale owners have a difficult time in managing all their livestocks. This is mainly because of the limitations that are due to the lack of an effective information system to help these farmers to manage a variety of livestock species. Managers also face a hard time in keeping track of all these information and ensuring that everything is stored precisely and up to date. Besides, reports such as production report, health report, and vaccine report that need to be produced are done manually by retrieving data from the filing systems and calculating them manually. Thus, a good management of livestock information is a very important aspect that should not be taken lightly will surely lead to increase productivity to other aspects of the business.

Furthermore, University Putra Malaysia is one of the leading public universities in Malaysia especially in studies regarding the agriculture field. Therefore, UPM has infrastructure for the study of livestock to be used by students in learning related subjects in their curricular structure. At the moment, the management of the livestock is mostly done by keeping record in paper-based systems. Students also have to manually calculate all the variables regarding the livestock. To solve all these problems, an information system to aid farmers and managers in managing all the information regarding their livestock is proposed. The 'Livestock Management Information System' or Livestock MIS is an electronic

information system that will assist users (i.e., farmers) by providing functions such as inserting, updating and calculating in order to help them in managing their livestock and assists them for decision-making. These systems revolutionize the way livestock in farms are managed that will lead to a better business.

Methodology

To ensure that the Livestock MIS can be used effectively by the users, the system must be presented in a simple and learnable way. This is because most farmers in Malaysia have limited computer literacy and knowledge. Therefore, a complex system that is difficult to understand will surely be a huge barrier for them in using the system efficiently. In order to build a system that fits the farmer's needs and at the same time is easy to use and understand, the development method must be a method that works closely with the users (farmers) throughout the development process. In which they can provide feedback and ideas about the features to be implemented in the system. Therefore, the most suitable approach to develop the Livestock MIS is Rapid Application Development (RAD). RAD is also known as the Agile Development Methodology (J. Martin, 1991). This development method allows the flexibility of the development to be revised and refined throughout the beginning of development until the end in an incremental iterative way. Figure 1 gives a clearer view of the processes involved in RAD.



Source: WaveMaker

Figure 1: *Rapid Application Development Methodology*

Analysis and Quick Design

This is the first stage in the RAD methodology of system development. In this stage, the initial requirements for the system is elicited and analysed in order to identify the main funtionalities of the system to be developed. The main technique used for eliciting requirements is interview. This technique requires a lot of user commitments and a student from UPM which is currently pursuing her bachelor's degree in animal science in Faculty of Agriculture, is chosen as representative. The user has wide knowledge regarding the care of livestock in farms. Besides that, she is also involved in the management of the livestock in UPM so the existence of the Livestock MIS will aid her and other students as well as UPM staff in managing the livestock. Based on the initial requirements, a quick and basic design is

developed to give a view of what he or she can expect from the system and give their feedback in improving the design. A few meetings were conducted and the meetings were mostly held at the Faculty of Agriculture.

Besides that, a study on existing similar systems available in the market were carried out to identify the main features offered by them and were used as reference for the proposed system. Table 1 summarised a list of main features offered by tambero.com, farmwizard.co.uk, and cattlemax.com.

Table 1: Comparison between features

	Tambero.com	**Farmwizard.co.uk**	**Cattlemax.com**
Livestock Record	Yes	Yes	Yes
Produce report	Yes	Yes	Yes
Graphical Analysis	Yes	Yes	Yes
Weather forecast	Yes	No	No
Platform	Desktop with mobile version	Desktop with mobile version	Desktop and mobile application

As seen in the Table 1, all of the three similar systems provide main functionalities which are livestock record, producing reports and graphical analysis. However, those systems does not provide functionalities to calculate feed formulation and calculate expected meat carcass that are essential for production purposes. Therefore, the proposed Livestock MIS addressed the absence of these two functionalities and at the same time does not neglect the importance of the other main functionalities (e.g., livestock record, produce report, and analysis). Some background study were also conducted to elicit certain information regarding livestock and for development purposes (i.e., T.C.Loh, 2004; Mohd Danuri and Shahibi, 2015; David et al., 2007).

Morevover, we aims to propose a Livestock MIS that will not only help farmers in managing their livestock, but also beneficial for them to predict the productivity of their livestock. Therefore, other functionalities related to milk production and health of the livestock are also delivered. Use Case diagram in Figure 2 illustrates the interaction between the user (i.e., farmer) and the main functionalities offered by Livestock MIS. In brief, it has 5 main functionalities, which allow users to:

- produce a milk production report and view milk production
- produce a health report and view health statistics
- produce a vaccination report
- calculate feed formulation for the livestock
- calculate expected meat carcass by the livestock

Figure 2: Use case diagram for livestock MIS

Demonstration, Development, and Refinement of Prototype

This stage basically focuses on construction of the proposed system where the actual system is developed. As for Livestock MIS, at the beginning it was constructed based on the proposed design from the previous stage. In RAD, however, users continue to participate and can still suggest changes or improvements as actual screens or reports are developed. Therefore, this gives a significant for improvement to ensure that the development of the system meet the user requirements even if there are slight changes in the requirements. This stage will go through several cycles of prototype development. In which, each cycle will include taking new requirements, making new designs and implementation based on the customer's requirements. It will be repeated until the system meets the user's requirements and expectations. For Livestock MIS, three cycles were went through where the prototype were revised. However, the main focus of each cycle is on developing main functionalities of the system while improving the system in terms of design and coding to avoid bugs and errors.

The Livestock MIS is developed as a web application. Therefore, the technologies used for its implementation are technology used for web development. For the design and content of the web page, HTML5 and CSS coding is used as these are the main technology and most suitable to be used for web development. For the web server, Apache is used as the web server. Apache is one of the world's most popular web server nowadays and has proven to be one of the most reliable as compared to other web servers. The database used to store

all the data in the system is MySQL database with SQL(Structured Query Language). The server side programing to connect the web to the database is the PHP language. All these are compiled and configured using the XAMPP server which is a free and open source cross-platform web server solution stack. In the XAMPP server there is also the PhpMyAdmin which aid in the management of the MySQL database. PhpMyAdmin allows creating tables, inserting data, updating data and several other features a lot easier because not everything has to be done using the SQL(Structured Query Language).

Testing and Deployment

A few types of testing was conducted in order to make sure that the system is actually solving the issues addressed and fulfill users' requirements gathered at earlier stage. At this stage, all types of testing like unit testing, integration testing, system testing, acceptance testing were carried out. If any changes are required or if any bugs are caught, then they will report it and changes will be made or the bugs are fixed. The system is ready for deployment after successful testing. Overall, the system worked as proposed, however, some adjustments could be made for further improvement.

Results and Discussion

This section describes the implemented functionalities of Livestock MIS.

Managing Livestock Inventory

The system provides basic functionalities which are add, insert, delete, and update livestock information in the database. This including information about health, diseases, and milk production.

Figure 3: Livestock inventory

User will be able to add a new record of livestock into the inventory or database. When a livestock is added into the inventory, it will be assigned to a unique ID which is based on the tagging placed on the livestock when it is born or a new livestock is brought in. User will be able to insert and update information of the livestock. Some of the information inserted can be updated from time to time, while others are not editable. Examples of information that can be updated are weight, and health condition. The system will allow user to view and monitor the livestock information in order to help user in keeping track the progress of the livestock. Additionally, user able to update livestock if they have disease, by key-in the type of disease, the date it diagnosed, and the date it cured from the disease. Figure 3 shows screenshots that support some of the functionalities.

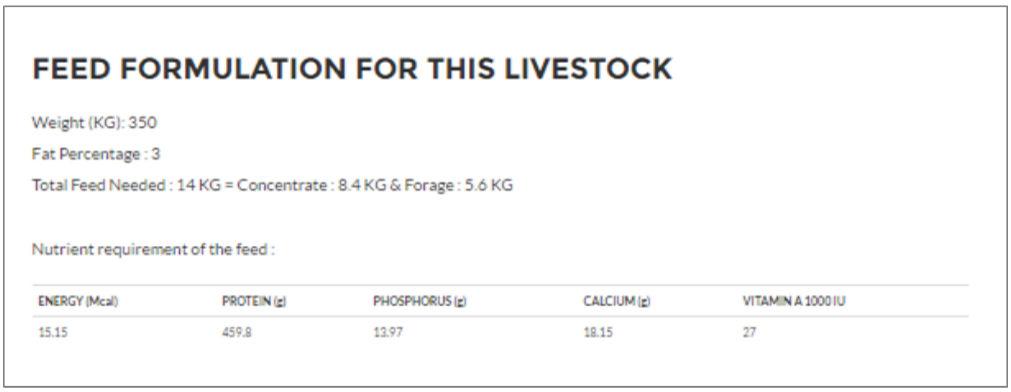


Figure 4: Livestock feed formulation

Feed and Carcass Formulation

Figure 4 shows the interface for feed formulation. The input need to be entered are weight (kg) and fat percentage of the livestock. The results is in a form of a table that list the sufficient nutrients needed for the livestock in their diet (i.e., protein, phosphorus, calcium and vitamin) . It is also useful to determine the amount of food that should be given to the livestock based on its breed and weight. While, Figure 5 shows functionality to allow user to calculate the expected meat carcass based on its weight.

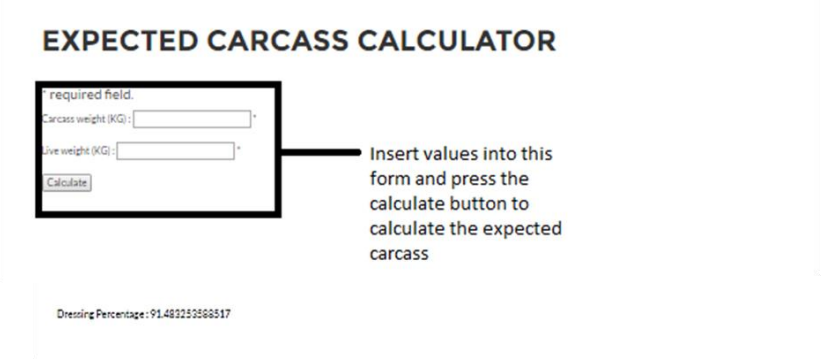


Figure 5: Expected carcass calculator

Monitoring Livestock and Milk Production

Figure 6 shows the interface that displays the milk production for the whole inventory. Users will need to add and update the inventory each and every time the livestock produces milk. The variables that need to be recorded are the milk volume and the date taken. In Figure 6 also shows the vaccination inventory where it displays the latest vaccination date of each livestock. Therefore, users will be able to see which livestock has not been vaccinated for a certain amount of time. After the livestock has been vaccinated, user must update the vaccination date into the system. In addition, livestock's health information and reports are also provided.

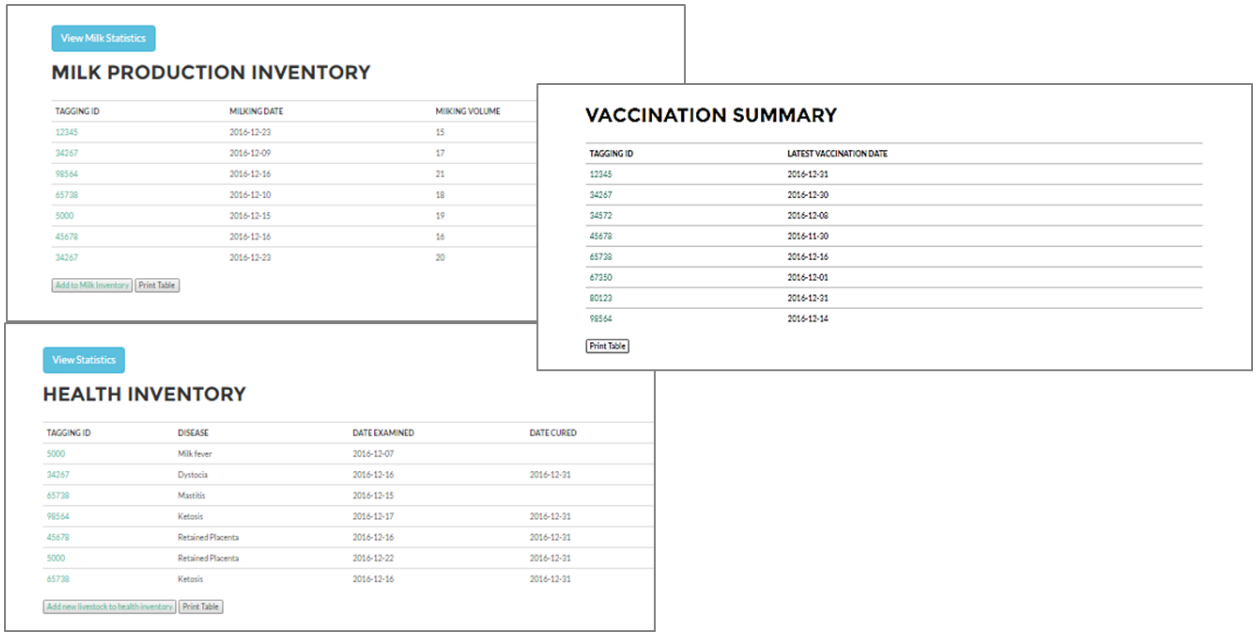


Figure 6: Livestock reports

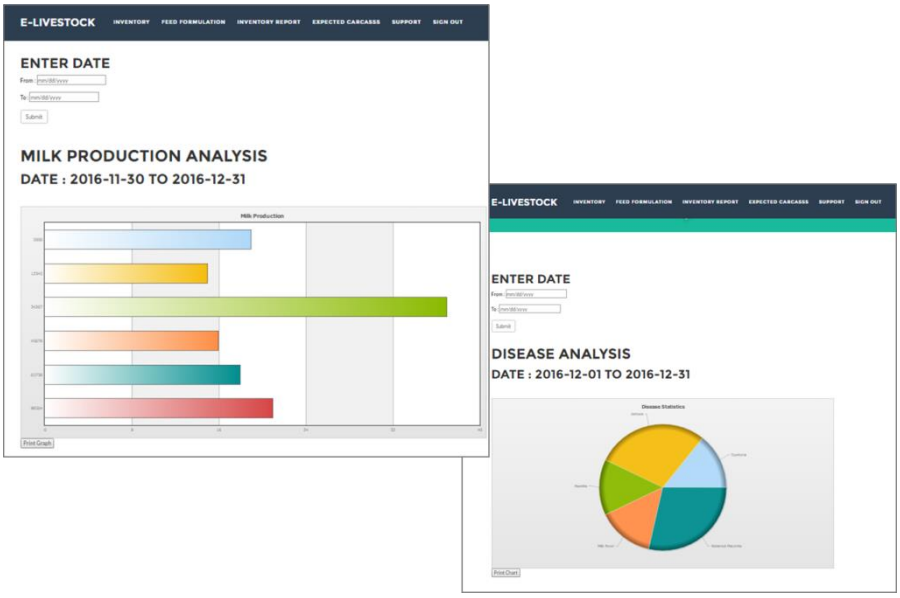


Figure 7: Statistical reports

Statistical Reports

Figure 7 shows the statistical reports generated by the system. This including a milk production analysis that shows the amount of milk produced by livestock based on the duration entered by the user. The figure also shows a disease statistical analysis generated in a pie chart form. It shows type of diseases faced by the livestock in a certain duration. This information will increase awareness and help user to plan a strategy in reducing the outbreak.

Conclusions

As a conclusion, this system is developed to assist farmers in managing their livestock and improving productivity. At the moment, most farmers opt to use the traditional filing system in managing their livestock. The small minority that has chosen to use the available software systems have a difficult time in understanding and using the complex features of these software. Therefore, the development of the livestock MIS is aimed as a more simple, user-friendly system for the farmers to be able to manage their livestock for productivity and monitoring purposes. Though, there are many improvements and enhancements that can be made in order to improve the Livestock MIS as a whole for future work.

Acknowledgment

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Adaptation toward Kenaf Bioretting Technology by Farmers: Evidence from Merchong, Pekan Pahang

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Bio-retting technology currently introduced by National Kenaf and Tobacco Board (NKTB), aims to promote farmers producing long kenaf fibre. Conjunction to this, the aims of the study to explore factors that been identified such as farmers' understanding, capability, perceive, and ability to perform bio-retting technology. Farmers from five villages in Merchong, Pekan, Pahang were interviewed. From the four factors tested result on chi square test indicates that factor on farmers' capable and ability shows significant difference at alpha 0.05 as compare to factors understanding and perceive. On the correlation test, Pearson's correlation and Spearman Rho result shows that they were no correlation between farmers' characteristic such as gender, income, education, and age. The result presented on correlation was not significance due to the sample size. For future suggested to more in-depth study by examine farmer's attitude and behavioural component by testing psycho-social theory.

Introduction

Kenaf as an industrial commercial crop is a fiber-bearing plant (Dauda *et al.,* 2013). Kenaf also known as bast fibre crop with an advantages such as higher fibre yield, and greater flexibility as an agricultural resources, over the other bast fiber, with the high potential as fibre material or lignocelluloses material (Paridah *et al.,* 2009). Traditionally kenaf long bast fibre was used as cordage and transform into modern composite material (Ramesh, 2015).

To separate fibre from the entire surrounding plant material known as retting (Ramesh, 2015). Retting is a process of removal gum includes pectin, hemicelluloses, lignin, and other impurities without damage to cellulose fibre. Water retting methods consider being traditional where kenaf green bast were soak in pond, river water and tank. Whereby indigenous bacteria attack the gum in an anaerobic process and this process can lead to contamination of the water source. Presently, there was much more eco-friendly method to produced kenaf long fibre by mean of microbe and enzyme (Yu and Yu, 2010). Bio-retting is

another term used when dealing with water and microbe or enzyme, consider as new technology to produced long kenaf fibre. According to Paridah *et al.,* (2013) water retting produced significant high quality of kenaf long fibre. Microbe or water retting provide best opportunity for large scale production with high quality fibre (Visi *et al.,* 2013).

Improvements and efficiencies in production and productivity of crops require the use of competency technology input (Mysore *et al.,* 2014). Regarding to this notion, it is important to understand the factors to ensure the development for appropriate and successful technology project. According to Abebe *et al.,* (2013) technology may provide an opportunity for farmers in making rational decisions based on the perception of farmers as well as the suitability of the technology in terms of value and peculiar for the future. The main objective of this study is to explore factor that influence farmer's acceptance on the bio-retting technology to produce long kenaf fibre.

Method

Study Site

Respondent were farmers from Kampung Permatang Tepong, Kampung Permatang Durian, Kampung Permatang Limau, Kampung Badong and Kampung Padang Merchong, Pekan, Pahang. Selection of study respondents were based on factor such as involvement in kenaf cultivation, acreage and production. Overall farmers from these five villages involved in kenaf cultivation more than two years. In term of acreage coverage, a total of 400 hectare was planted with kenaf since paddy is their main crop while kenaf was cultivate during offseason. The end product of kenaf is to produce fibre by mechanical retting. Factors such as short planting duration, fast growing with high production, and government's incentives as pull factor to farmers made kenaf as off season crop in these areas.

Data collection

Data were collected through face to face interview using a structured semi-standard questionnaire and the farmers were asked to rate each one on scale 1 to 5. The question was divided into five sections, which are farmers' personal characteristic, potential farmers' understanding on bio-retting technology, farmers' capability to perform bio-retting technology, farmers' perceive toward bio-retting technology, and finally ability of farmers to adopt this technology.

Statistical Analysis

Statistical analysis was executed using the software IBM®SPSS 22. Total number of respondent participate in this study were 21 farmers. Based on the amount, it can be consider that the sample size is low, non-parametric test was used to analyzed data collected. Selection of non-parametric test analytical because it is best suited to small samples size with five-scale social. Second, two-tailed chi-square tests were performed to test the differences between farmers with respect to their characteristics and choices for various questions. Third, correlation analysis was performed to assess the potential relationships between farmers' characteristics and their choices. Pearson's and Spearman Rho correlation tests were used between two interval scale parameters. Spearman Rho based on assumption that the data were not normally distributed.

Result

Farmers' personal characteristic

In this paper result will be present in five section based on the farmers' personal characteristic, farmers' understanding on retting technology, capability to perform retting technology, farmers' attitude and ability.

Total of 21 farmers were interviewed and basic characteristic of farmers was summarized in Table 1. Out of 21 farmers, 16 (76.2%) were men and 5 (23.8%) were women. In terms of level of education, 14 respondents (66.2 %) received at least primary school, whereas another 7 respondents (33.3%) finish secondary school. All respondents (100%) were Malay. Income show significance difference where 1 respondent (4.8%) received income more than RM2500 as compare to other with 17 respondents (81.0%) received less than RM1500 and 3 respondents (14.3%) received less than RM2500 (χ^2 = 21.714, p = 0.00). This is due to this particular farmers have other farming income such as small family business. Ages was measure based on years with mean of 42.3850, and Standard Deviation, 7.81969, minimum is 24 years old while maximum is 56 years old.

Table 1: Farmers' personal characteristic

Profile	Frequency	Percentages
Gender		
Men	16	76.2

Women	5	23.8
Level of education		
Primary	14	66.2
Secondary	7	33.3
Income		
500-1500	17	81.0
1501-2500	3	14.3
2501-3500	1	4.8
Race		
Malay	21	100

n = 21

Farmers' understanding on bio-retting technology

Factor on understanding of farmers' on bio-retting technology presented in Table 2. Three items are listed, and total of 21 farmers, 16 were male (76.2%) and 5 were female (23.8%). The mean score on the statement range between 2 and 3 and standard deviation not exceed than 1. This indicate that the dispersion of score was near the mean, item 1 and 2, are significance difference at alpha 0.05 between items and gender (item 1, $\chi^2 = 29.476^b$, p = .000); (items 2 ,$\chi^2 = 14.857^c$,, p = .001). Items 3 were not significance difference at alpha 0.05 between item and gender. Majority of farmers agreed that they were less understand on the statements of method in production of long kenaf fibre by using bio-retting and the process producing long quality fibre by mean of bio-retting. Results given by the farmers mostly influence by the present fibre production practices. For long fibre production for five villages was applied by using mechanical retting. Correlation tested result indicate that they were no significant difference between farmers' characteristic and factors tested, based on this no data presented.

Table 2: Farmers' understanding on bio-retting technology

Items	Mean	Standard Deviation
Do you understand kenaf bio-retting methods in long fiber production?	2.857	0.72703
There are seven steps in the processing of bio-retting. Do you understand each step to	2.6667	0.57735

be carried out?		
By attending this workshop on bio-retting, is it improve your understanding of this technology?	2.8571	0.91026

1: Not very understand, 2: Not understand. 3: Less understand, 4: Understand, 5: Very understand., χ^2 used to determined differences $p = 0.05$ and $p = 0.01$.

Farmers' capability to perform bio-retting technology.

Factor on capability of farmers on bio-retting technology presented in Table 3. Four items are listed, and total of 21 respondents, 16 were male (76.2%) and 5 were female (23.8%). The mean score on the statement range between 2 and 3 and standard deviation no exceed than 1. This indicate that the dispersion of score was near the mean, item 2, 3 and 4, clearly indicate there are significance difference at alpha 0.05 between gender and items, for (item 2, χ^2 = 10..810[b], p = .013); (items 3, χ^2 = 3.857[a], p = .050); (items 4 χ^2 = 30.85[c], p = .000). For item 1, there is no significance difference at alpha 0.05. This demonstrates farmers more caution in making decision and agreed they should attended more exposure and workshop or courses particularly on this technology for them before engage. Correlation tested result indicate that they were no significant difference between farmers' characteristic and factors tested, based on this no data presented.

Table 3: Capability of farmers on bio-retting technology

Item	Mean	Standard Deviation
If the methods of bio-retting were introduced to your area, are you willing to apply?	2.9524	0.92066
If you are given the opportunity to produce the fibre through the process bio-retting, are you able to do it?	3.2857	0.90238
If you are given the opportunity to engage in a course, are you willing to attend?	4.2857	0.46291
If your area is selected as main bio-retting technology site, is it possible the community willing to do?	4.0000	0.31623

1: Very not able, 2: Not able, 3: Less able, 4: Able, 5: Very able,
χ^2 used to determined differences $p = 0.05$ and $p = 0.01$

Farmers' perceive on bio-retting technology

Factor on perceive of farmers on bio-retting technology presented in table 4. Five items were listed, and total of 21 respondents, 16 were male (76.2%) and 5 were female (23.8%).The mean score on the statement range between 2 and 3 and standard deviation no exceed than 1. This indicate that the dispersion of score was near the mean, item 1, 3 and 4, are significance difference at alpha 0.05 between gender and items (item 1, $\chi^2 = 21.714^b$, $p = .000$); (items 3 $\chi^2 = 14.952^b$, $p = .005$); (item 4, $\chi^2 = 12.333^c$, $p = .006$). For item 2 and 5 are no significance differences at alpha 0.05. Statement on introduced bio-retting kenaf as best choice crop and marketing was not farmers' priorities. Based on this evidence, statement on change farmers' view on the potential of kenaf, subsidies provided by the government and farmers decision on choice of planting crop in field were more preferred. Correlation tested result indicate that they were no significant difference between farmers' characteristic and factors tested, based on this no data presented.

Table 4: Farmers' perceive on bio-retting technology

Item	Mean	Standard Deviation
Bio-retting changing your prospect on the future of kenaf	4.0952	0.43644
Bio-retting technology receive kenaf as the best option crop for farmers to plant	4.0476	0.66904
Willingness to engage in kenaf cultivation no other crops suitable grown on your farm.	3.2857	0.90238
Does your involvement in the kenaf cultivation due to subsidies granted by the government	4.3333	0.85635
Market is the main factor pushing you involved in this kenaf cultivation	4.6667	0.48305

1: Very not agree, 2: Not agree, 3: Less agree, 4: Agree, 5: Very agree.
χ^2 used to determined differences $p = 0.05$ and $p = 0.01$.

Farmers' ability on bio-retting technology

Factor on interest of farmers on bio-retting technology were presented in table 5. There are 7 items listed and out of 21 respondents, 16 were male (76.2%) and 5 were female (23.8%). The mean score on the statement range between 2 and 3 and standard deviation has no exceed than 1. This indicates that the dispersion of score was near the mean. Item 3, 5, 6, and 7 showed significance difference at alpha 0.05, between items and gender (item 3: $\chi^2 = 8.857$, $p = .012$); (items 5: $\chi^2 = 18.000$, $p = .000$); (item 6: $\chi^2 = 15.381$, $p = .002$); (items 7: $\chi^2 = 26.000$, $p = .000$). For item 1, 2 and 4 are no significance difference at alpha 0.05. Majority of farmers convince four statements on bio-retting technology will enhance their ability on kenaf cultivation, confident the potential of kenaf,kenaf pricing and ideas from farmers should be acceptable by agency.

Table 5: Farmers' ability on bio-retting technology

Items	Mean	Standard Deviation
Throughout your engagement do you believe kenaf has a bright future	4.3333	0.48305
Are you confident that the technology will accelerate kenaf cultivation your area.	4.3810	0.49761
Bio-retting technology will add interesting planting kenaf.	4.3333	0.57735
Involvement in the kenaf industry because there are no other options.	3.0000	0.72548
Involvement in the kenaf cultivation are convinced of the potential of this crop.	4.1429	0.47809
Price of long fibre influence farmers in this kenaf cultivation.	3.7619	0.88909
Agency often practices open door and received views from farmers	4.0478	0.38421

1: Not very agree, 2: Not agree, 3: Less agree, 4: Agree, 5: Very agree. χ^2 used to determined differences $p = 0.05$ and $p = 0.01$.

Discussion

Three statements were tested on farmers' understanding toward bio-retting technology, two statements referred on method in production of kenaf long fibre by process bio-retting technology and the extent of farmers how well understand at each steps taken in the production of long fibre production. This clearly indicates that the majority of the farmers answered that they were less understand on bio-retting technology. Conversely, overall the statements were not rejected, but the lower score was because their experience on technology knows how the main constraint to farmers was. Adoption bio-retting technology to farmers is suggested to be formalized and recommended that comprehensive intense workshop should be conducted by agency involved. Läpple *et al.*, (2015) articulate clearly that agricultural education facilitates innovation is important to build this positive link. In addition to the

promotion and increase access to education factor such as evaluation of the agricultural system is critical to warrant the suitability aims to drive innovation. The main purposed of the suggested seminar is to expose and enhance their knowledge on bio-retting technology.

On the concerns of the farmers' capacity on adoption of bio-retting technology for long kenaf fibre production, it clearly indicates that the majority of farmers strongly agreed that they were capable to participate and getting engage with bio-retting technology. This argument was supported by statement on at what extent the farmers were willing to participate, if their district were introduced to this technology. Another statement referred on the community, as a pioneer district that undergoes this technology, at what extent the communities were willing to participate. Their respond on these statements were positive, overall farmers agreed and appreciated. Even though it seems that these statements appear to be stereotype, the differences were based on the goal where for the first statement referred to farmers personally and community for household. Although the majority of the farmers agreed on the above statement to strengthen their confident that they should be provided proper knowledge and expertise in order to ensure successful project. According to Abebe *et al.*, (2013), adaptation of decision is considered to be crucial to the important of education and dissemination of information and suggest mobile phone, broadcasting media are the proper mean to promote new technology.

In response to the statement on how farmers perceive on bio-retting technology, it appears that farmers generally agreed that bio-retting technology will acts as pull factor and selected kenaf as best desirable crop to plant unless they are given opportunity in pioneering the production of kenaf long fibre. This in line with statement that bio-retting will change the view on the future of kenaf, cultivation in their district, this subject to proper planning and implementation, of this technology. Majority of farmers agreed and suggest that if possible mechanical retting and bio-retting technology should be established in their district so that the conversion process of fibre will be more efficient costing and time. In contrast to statement on choice in planting kenaf because there were no other suitable crops,the farmers disagreed, the pertinent reason farmers involved in kenaf cultivation in their district were because of market mobility and subsidy by the government. As usual kenaf production by farmers such as green or dry stems include fibre are marketed to the agency care taker National Kenaf and Tobacco Board (NKTB).

Reference of farmers' ability in kenaf cultivation can be illustrated in two statements. Farmers involved in kenaf cultivation believed and strongly agreed the potential of this crop and their levels of confident toward this crop were also high. This is also due to the support by National Kenaf and Tobacco Board (NKTB), community and family. Normally NKTB provides farmers with facilities and expertise whereas family members and community always working hand to hand together starting from planting, harvesting and process mechanical retting. Nevertheless, the farmers were less agreed on the involvement on kenaf cultivation not because of choice or no other crops suitable to be planted, the interest of involvement mainly based on the potential of this crops as future fibre crops. Overall, the farmers also agreed that bio-retting as mean of value added technology which can be developed in small scale for smallholder, with low cost and can produce quality fibre in term of its strength and desirable physical characteristics. Another strong evident is on the pricing where majority of farmers agreed that using bio-retting technology, they are able to secure good price for long kenaf fibre where the pricing of long kenaf fibre are based on the quality, strength and other physical properties of the kenaf fibre. Furthermore, the farmers agreed feeling comfortable with NKTB in which throughout their involvement in kenaf planting, NKTB is always supportive and practices open door by listening farmers ideas and problems that they faced.

Conclusion

The farmers' rationality is consistent with four factors that been identified that includes understanding, capacity, perceive, and ability. By exploring the farmers' opinion on bio-retting technology, proven the tendency of farmers to adapt on this technology consider being moderate. This trend of answering occurs probably because majority of the farmers vague. The extent of farmers in influence in shaping policy, option and implementation were minimal any decision mainly depend on their own knowledge (Motsumi *et al.*, 2012).

For the purpose further in depth study related to farmers' decision making and examined their level personal of acceptance it is possible to assess them by adopting psycho-social farmers. Psycho-social and cultural factor are the most important factor when relates in decision making in adoption innovative practices (Warren et al., 2016).

Another question arise by the farmers are sceptical on the implementation and adaptation on bio-retting technology, they consider that this was top down project and they suggest better

extension programs, workshops or courses and consensus between farmers and care taker should be emphasis. To enhance chances of a close relationship between researchers, agricultural education and farmers, professional development courses related to farmers is a necessity for the creation of a better knowledge and appropriate acceptable by farmers, for example by establishing central of excellence based on the strength of the local (Läpple *et al.*, 2015).

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Effects of Bag Slow Release Fertilizer Containing NPK-Organo-Zeolite on the Growth of *Morus alba*

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Natural zeolite has been used in agricultural practices to improve the plants yields and productivities. Moreover, the adsorption capability of zeolite makes it capable to and released the nutrients slowly and thus, it could control eutrophication. The NPK-Organo-Zeolite is a surfactant-modified zeolite loaded with nitrogen, phosphorus and potassium. The role of NPK-Organo-Zeolite as a slow release fertilizer was improved by inserting it in a tea bag and it can be collected for further reuse. The performance of NPK-Organo-Zeolite was compared by using the reusable tea bag and the traditional top dressing practices on Morus alba and also other commercial fertilizer: monoammonium phosphate and monopotassium phosphate. The characterization of materials was performed using Fourier transform infrared spectroscopy to identify the presence of surfactant molecules and the scanning electron microscope with energy dispersive X-ray analysis proved the modification does not change the zeolite structure and morphology. The result of the plant growth shows significant improvement of the number of leaves and number of branches with the application of NPK-Organo-Zeolite especially in the tea-bag application. Besides, the number of nutrients uptake from NPK-Organo-Zeolite by the plant for tea bag application was the same with the top dressing application. Thus, the method of fertilizer application using tea-bag does not affecting the plant growth and the nutrients uptake which make it possible to reuse the collected zeolite inside the tea-bag for further application such as in recycling the NPK-Organo-Zeolite fertilizer.

Keywords: surfactant-modified zeolite, slow release fertilizer, nitrogen, potassium, phosphorus, tea-bag application, Morus alba

White mulberry, *Morus alba* is categorized in *Moraceae* family that has been used as a plant model to test the performance of regenerated NPK-Organo-Zeolite. The NPK-Organo-Zeolite is a slow released fertilizer that consists of surfactant modified zeolite (SMZ) and nutrients for the plant growth development have been patented with the identification number: PI 2014703213 (Malek *et al.,* 2014). The usage of conventional fertilizer led to eutrophication problem. About 40-70% of nitrogen (N), 80-90% of phosphorus (P) and 50-70% of potassium (K) applied by conventional fertilizer have been released to the environment by agricultural practices (Wu *et al., 2008).* The conventional fertilizers such as chemical fertilizers are the most commonly used in agriculture and cause these problems. Hence, 'Good Agricultural Practices' is required to solve the effect of the pollution by the release of these nutrients (Beaudoin *et al.,* 2005).

Application of SMZ as a controlled release fertilizer had been proven to control the effect of nitrate pollution (Li, 2003). This approach is one of the 'Good Agricultural Practices' that could be implemented by the farmer to produce a better yield of the plant in a greener way. The SMZ is a product of modification of the outer surface of zeolite using surfactants molecules such as hexadecyltrimethyl ammonium (HDTMA). The advantage of SMZ is its ability to attract both cationic and anionic compounds (Li, 2003). On the other hand, unmodified zeolite could only be attached to cationic compounds and therefore, limit the zeolite to load with N, P and K as P element in phosphate anions could not be able to attach on the unmodified zeolite. Thus, previous researches have discovered the new approaches to overcome these problems by producing the NPK-Organo-Zeolite (Malek *et al.*, 2014). The major advantage of NPK-Organo-Zeolite was the ability to release the nutrients slowly to the soils and the zeolite itself is not soluble in water and stable at harsh conditions (high temperature and acidic or alkaline condition). However, the uses of natural zeolite in abundance for agricultural practice may disturb the natural sources (Mumpton, 1985). These situations have given an idea to reuse and recycle the natural zeolite by collecting them after used so that the zeolite could regenerate forming original zeolite and thus, use again as a controlled release fertilizer.

Even though there are some studies applying SMZ as a slow release fertilizer (Li, 2003; Bansiwal *et al.*, 2006), this would insufficient to improve the 'Good Agricultural Practices'. The idea of reusing the NPK-Organo-Zeolite after the fertilizer application to the plant may help the farmers. Regeneration is a process which would reuse the fertilizer by removing inert material from natural or synthetic zeolite (Li and Bowman, 2000). The used zeolite needed to collect from the tea bag after the application so that the zeolite could be used to regenerate as a new fertilizer. Therefore, it is aim of this research to study the performance of NPK-Organo-Zeolite in a tea-bag application compared to it's top dressing application.

Materials and Methods

Preparation of NPK-Organo-Zeolite

The NPK-Organo Zeolite was prepared by mixing 40 g of Cli with 5000 ppm of potassium chloride solution using magnetic stirrer for 7 hours. The mixture was filtered through 185 mm Macherey-Nagel filter paper and the solid residual was oven dried at 80°C (Malek *et al.*, 2014). Then, the solid residual was ground using mortar and pestle forming a powder and sieve to ensure all solid become K^+-Cli powder. This step was repeated for 3 times until all ion exchange sites of the zeolite were filled with K^+. After that, organo-zeolite was prepared by mixing 10 g of K^+-Cli powder with 500 ml of HDTMA, 4 mmol/L and stirred overnight. The mixture was filtered and the solid residual was dried at 80°C overnight. Next, 40 g of Organo-K^+-Cli was mixed with 5000 ppm of monoammonium phosphate solution and stirrer for another 7 hours. The solution was filtered and oven dried at 80°C overnight before the solid residual being crush using mortar and pestle, and sieve to ensure all solid were in the

powder form. The final product is called NPK-Organo-Zeolite. Then, the sample was characterized using Fourier transform infrared (FT-IR) spectroscopy (NICOLET Is5 FT-IR Spectrometer) and scanning electron microscopy (SEM) with energy dispersive X-ray analysis (EDX) (Hitachi).

Application of Fertilizer

The fertilizer was applied to the 2 months old of *M. alba*. The fertilizer samples used was the natural clinoptilolite (Cli), monoammonium phosphate (MAP), monopotassium phosphate (MKP), top dressing of NPK-Organo-Zeolite and the tea-bag containing the NPK-Organo-Zeolite for each triplicate of *M. alba* plants. The plants were watered every day and placed in the site with full of sun light exposure. The plants were harvested after 8 weeks and the plant parameters was collected.

Data Collection

The plant parameters were analysed to compare the plant growth among each application of the samples. Plant parameter that has been measured after the plant being harvest is the number of leaves and number of branches (Ramanjulu *et.al.,* 1998). Moreover, the fresh biomass for each part of plants was immediately measured to prevent the moisture loss. The clean segmented plant was weighted using electric balance and then, placed in a paper envelope and dried at 60ºC for 48 hours (Ramanjulu *et.al.,* 1998). The moisture from the plant was released to the environment through heating in the oven and the dry biomass of each part of the plant was recorded.

Nitrogen, Potassium and Phosphorus Content in Leaves

The analysis of macronutrients in the plants was done by determining the amount of nitrogen (N), potassium (K) and phosphorus (P) in the leaf. The dry leaf was ground and sieved, and the powder was used for this elemental analysis using specific methods for N, P and K by using Kjedhal method, colorimetric estimation and atomic absorption spectrometer, respectively (Vogal, 1994; Warncke & Brown, 1998). The analysis was done at the Institute of Veterinary, Kluang Johor and Institute of Agricultural, Ayer Hitam, Johor.

Results and Discussions

Characterization

The NPK-Organo-Zeolite was characterized using FTIR to determine whether the modification of the natural zeolite affected its structure or not. The FTIR spectra in **Figure 1** show the zeolite structure represented the peaks in between the ranges of 1111 and 471 cm^{-1}. The visible peak at 1111 cm^{-1} represented asymmetric stretching vibrations modes of internal T-O bonds in TO_4 tetrahedral (T=Si and Al) (Elliot & Zhang, 2005). Besides that, the 799 and 471 cm^{-1} bands were assigned to the stretching vibration modes of O-T-O groups and the bending vibration modes of T-O bonds, respectively (Colella and Wise, 2014). According to Malek (2011), the HDTMA-Br molecules formed two visible peaks at 2923 and 2851 cm^{-1} for the Organo-K-Cli and NPK-Organo-Zeolite. These two peaks represent the CH_2 asymmetric and symmetric stretching of HDTMA, respectively. This shows that the HDTMA molecules were successfully attached on the zeolite for samples Organo-K-Cli and NPK-Organi-Zeolite. The surface morphology and elemental analysis of NPK-Organo-Zeolite was examined by SEM and EDX which are presented in **Figure 2**. Compared to the natural zeolite **(Figure 2 (a)),** there were no changes among the K-Cli, Organo K-Cli and the final product of NPK-Organo-Zeolite. There are heterogeneous particle sizes observed in all samples. Moreover, the surfactant modification of zeolite creating Organo-K-Cli **(Figure 2(c))** does not affect the structure due to the zeolite highly stable. Besides, the EDX spectra show the composition of the main element in natural zeolite such silicon and aluminium that was bonded with oxygen forming tetrahedral crystalline structure (Colella and Wise, 2014). The Si/Al of the NPK-Organo-Zeolite from EDX analysis was 4.21 which in line with the typical Si/Al ratio for clinoptilolite which is ≥4 (Collela and Wise, 2014) 7 **(Table 1)**.

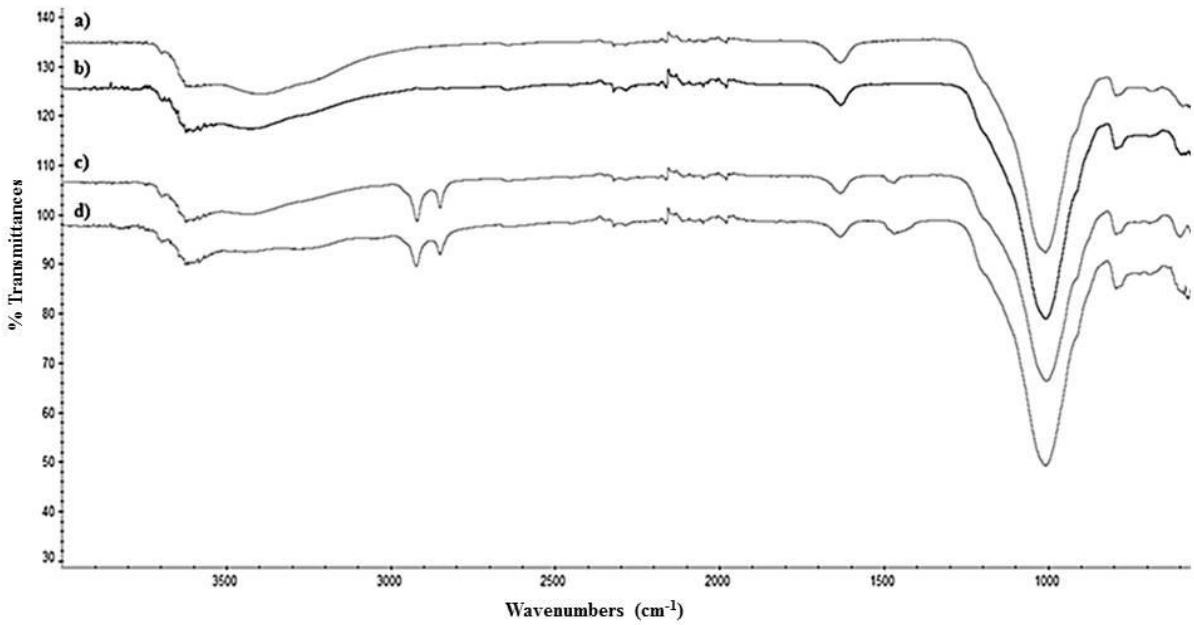

Figure 1: Comparison of FTIR spectra for (a) Cli, (b) K-Cli, (c) Organo-K-Cli and (d) NPK-Organo-Zeolite.

Table 1: Percentage of Si and Al and also the ratio of Si/Al in the samples.

Sample	Si (weight %)	Al (weight %)	Si/Al ratio
Cli	28.8	7.8	3.7
K-Cli	30.2	7.7	3.9
Organo-K-Cli	30.9	8.4	3.7
NPK-Organo-Zeolite	32.1	7.6	4.2

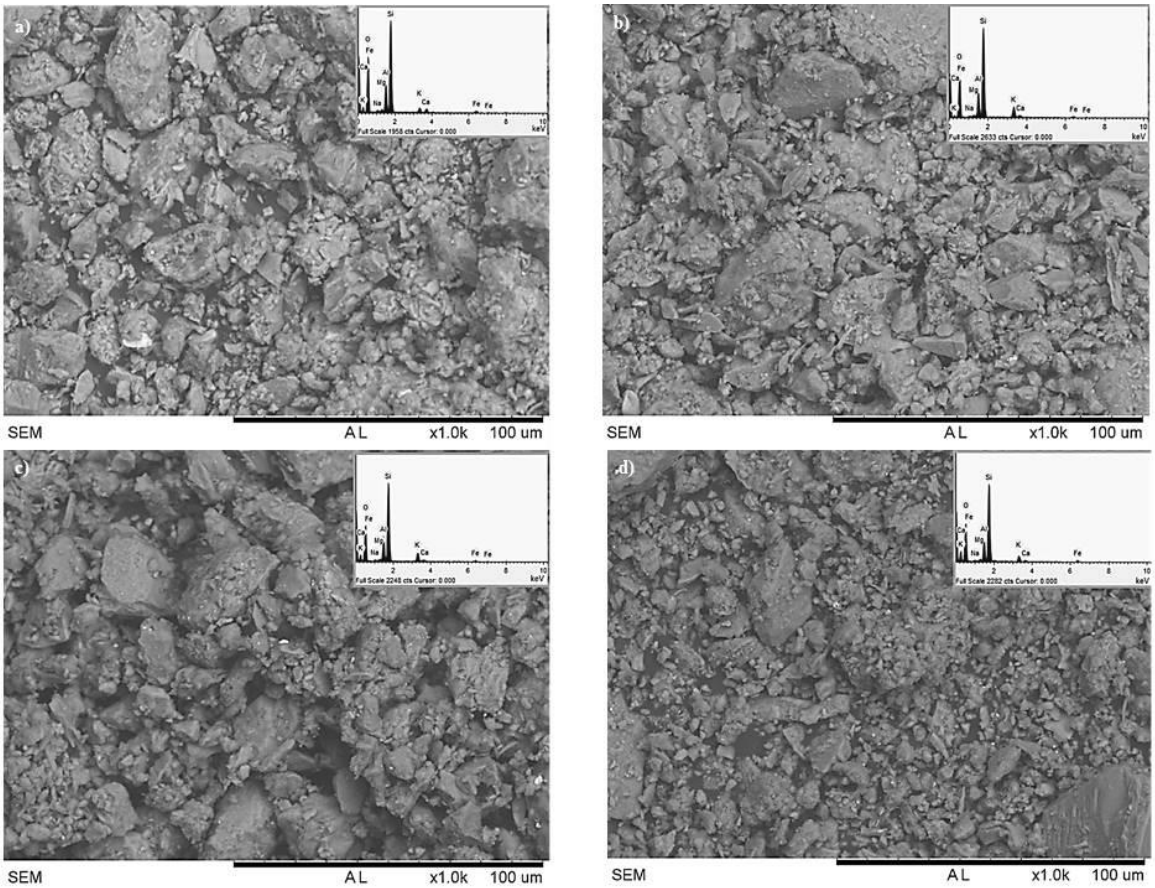

Figure 2: SEM micrographs and EDX spectra of (a) Cli, (b) K-Cli, (c) Organo-K-Cli and (d) NPK-Organo-Zeolite.

Plant Growth Study

The physical plant parameters were analysed to study the plant growth responsed towards different types of fertilizers treatments. According to **Table 2**, the total number of leaves, shoot length, root length and number of branches show different value among the fertilizers. The application of top dressing NPK-Organo-Zeolite and tea-bag containing NPK-Organo-Zeolite (NPK bag) shows positive improvement in the number of leaves and number of branches with mean score (M± SEM) 1.0 ^{a} ± 0 and 2.0 ^{a} ± 0.4, respectively. Whereas, the control, cli and MKP for all parameter were not significantly different among each other.

This is due to the ability of zeolite that can hold and released the nutrients slowly to the soils as compared to the control and cli samples (Hamzah *et al.*, 2014). Thus, this proved the ability of NPK-Organo-Zeolite that can release their nutrients either in top dressing or tea-bag application.

Table 2: Physical plant parameters during the harvesting day for each fertilizers application.

Sample	No. of Leaves		Shoot length		Root Length		Leaf Area		No of Branch	
	Mean ± S.E	S.D	Mean ± S.E	S.D	Mean ± S.E	S.D	Mean ± S.E	S.D	Mean ± S.E	S.D
Control	7.25a ± 0.95	1.89	23.83a ± 0.38	1.45	28.13ab ± 1.48	2.96	46.75a ± 16.91	33.82	1.50a ± 0.50	1.00
Cli	6.50a ±1.56	3.11	34.70a ± 1.13	2.26	22.75a ± 1.80	3.59	47.25a ± 15.84	31.67	1.50a ± 0.50	1.00
MAP	33.00c ±1.47	2.94	83.23b ± 2.49	4.99	34.70b ± 2.92	5.84	49.25a ± 17.45	34.89	2.50a ± 0.87	1.73
MKP	7.50a ± 1.19	2.38	32.73a ± 2.22	4.45	23.125a ± 3.25	6.49	66.00a ± 10.79	21.57	1.00a ± 0.00	0.00
NPK	9.50ab ± 1.50	3.00	32.53a ± 0.73	1.45	29.500ab ± 3.33	6.66	71.000a ± 4.04	8.08	1.00a ± 0.00	0.00
NPK bag	12.50b ± 2.06	4.12	33.78a ± 1.54	3.08	27.200ab ± 2.95	5.90	40.25a±14.77	29.55	2.00a ± 0.41	0.82

Plant Biomass

The fresh and dry plant biomass for leaves and root biomass was tabulated in **Table 3**. The difference between fresh and dry biomasses is known as the amount of water or moisture loss from the plant materials that cause by the heating. The presented data show major differences between fresh and dry biomasses for each part. The application of tea-bag containing NPK-Organo-Zeolite shows a higher fresh and dry biomass for all parts of the plants as compared to the top dressing NPK-Organo-Zeolite. This is due to the ability of zeolite that remains inside the tea-bag as zeolite could restore the water molecules presence inside the structure to the soils (Mumpton, 1985). Besides, it also indicates that the roots absorb most of the moisture from the soils and becoming a great water holding in the plant.

Table 3: The fresh and dry biomasses (g) for total leaves and roots during the harvesting day for each fertilizers application.

Sample	Total Leaves Fresh	Total Leaves Dry	Roots Fresh	Roots Dry
Control	6.32±0.84	1.72±0.21	19.27±2.25	5.90±0.90
Cli	5.91±0.23	1.56±0.04	17.42±2.49	5.05±0.98
MAP	33.28±1.09	7.94±0.50	22.19±1.34	5.37±0.63
MKP	6.81±1.33	1.61±0.34	12.47±1.71	3.29±0.58
NPK	7.49±0.91	1.97±0.28	18.34±2.40	5.53±1.00
NPKbag	7.70± 0.90	2.14±0.27	20.25±1.87	6.29±0.81

Nitrogen, Potassium and Phosphorus Content in the Leaves

In the elemental analysis of the plant, the basic nutrients content in leaves which are nitrogen, potassium and phosphorus were tabulated in **Table 4.** The results for the tea-bag NPK-

Organo-Zeolite application is not significantly different with that of top dressing NPK-Organo-Zeolite for the N, P and K content based on the Duncan test. Both of these samples fall into the same subset based on the mean comparison. The balanced nutrient was required for the equal development of a plant rather than focusing in one nutrient. This is due to each nutrient that plays an important part such as nitrogen for plant cell development (Jalali, 2005), phosphorus is vital for energy transfer and responsible for enzyme activation (Schachtman *et al*, 1998) and potassium for stress resistance (Marschner, 2012). Because of that, the equal amount of nutrients is required for plant development just like top dressing NPK-Organo-Zeolite and tea-bag containing NPK-Organo-Zeolite as compared with other applications.

Table 4: The concentrations of nitrogen, N (weight %), potassium, K (weight %) and phosphorus, P (weight %) in Mulberry leaves during the harvesting day for each fertilizers application.

SAMPLE	N (Weight %)		P (Weight %)		K (Weight %)	
	Mean ± SE	SD	Mean ± SE	SD	Mean ± SE	SD
Control	1.40 a ± 0.205	0.051	0.19 a ± 0.021	0.036	2.47 ab ± 0.033	0.058
Cli	2.04 b ± 0.019	0.032	0.24 ab ± 0.020	0.035	2.47 ab ± 0.176	0.306
MAP	5.06 c ± 0.106	0.183	0.31 c ± 0.042	0.072	1.97 a ± 0.033	0.058
MKP	2.01 b ± 0.063	0.110	0.37 c ± 0.007	0.012	3.83 c ± 0.328	0.569
NPK	1.99 b ± 0.032	0.056	0.29 b ± 0.003	0.006	2.87 b ± 0.088	0.153
NPK bag	1.98 b ± 0.023	0.040	0.27 b ± 0.026	0.046	2.63 b ± 0.240	0.416

Conclusion

The uses of tea-bag as a support system for the NPK-Organo-Zeolite does not affecting the plant growth study and the nutrients uptake by the plants as compared to its top dressing technique. Thus, making the application of NPK-Organo-Zeolite in the tea-bag highly potential to be used for other purposes such as recycling the used zeolite remaining inside the tea-bag to become a new recycled fertilizer. This is due to the stability of zeolite to have some modification without changing its crystalline structure.

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Patterns of Motivation towards Innovative Online Learning amongst Agricultural Undergraduates

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Online learning has become an effective supplementary mode of knowledge delivery. Information and Communication Technology (ICT) competency for agriculture graduates are important to enhance their extension roles in agricultural and rural development. Thus agriculture students should be motivated towards use of ICT especially in online learning as it could facilitate a more engaged learning since the students could learn at their own pace according to individual varying learning needs. Amongst others, online learning provides access to courses, communication and collaborative assignment. However effectiveness of online learning to a certain extent is dependent on students' motivation to adopt its use. Thus, this study was undertaken to determine students' levels of motivation in online learning by applying the Motivated Strategies for Learning Questionnaire. The study involved 78 undergraduate students from the Faculty of Agriculture of Universiti Putra Malaysia. The reliability of scale was measured by internal consistency analyses whilst students' levels of motivation in online learning detected by descriptive analyses. A survey method was used to elicit answers to research questions. The findings show that the level of agricultural students' motivation in online learning stands at moderate level. Online mode of learning has effectively complemented traditional classroom method for agriculture undergraduates at Universiti Putra Malaysia.

Keywords: Online Learning, Motivation, Agriculture Undergraduates

Introduction

Many universities have significantly shifted from lecturer-centered instruction to student-centered self-regulated learning (SRL). Many courses use online learning as supplementary tool to help teaching and learning. In e-learning environment student's skill in resource management is essential to becoming a successful learner. Basically, one of the ways to have a successful e-learning environment is by facilitating students in using SRL strategies that

open up wide avenues for learner's interaction. The capability of learners in mastering learning strategies and controlling learning progress is a must in an effective e-learning environment. Online learning provides many benefits that actually depend on the teaching approach itself. The perception of whether the delivery mode is a benefit or a challenge is based on learning style and students' learning needs. Rabe-Hemp, et al. 2009; Allen & Seaman, 2007; Dervan, et al. 2006; Atan, et al., 2004 have extensively listed the benefits of online learning. Despite the massive benefits, more importantly is students' readiness to adopt e-learning as limited ICT skills may pose a setback.

Methodology

The study sample comprised of 78 agriculture undergraduates at Universiti Putra Malaysia (UPM). Survey questionnaires were distributed to those students who have used online learning for at least one semester.

This research is based on online learning system that has been used for academic purposes including: (a) course management -upload file, file format conversion (PPT,PDF), provide course material with wiki tools, export and import course material (notes, quizzes, assignments). (b) class management - attendance, grades, progress reports, calendar of university courses (c) evaluation - teaching evaluation, online quiz, online course assignment (d) communication - e-mail with attachment, discussion / forum, online chat, video conferencing. Through online learning lecturers can upload course notes and materials, enter students' tests results, class attendance, and participate in forums. The modules provide a communication channel for instructors to post messages to courses such as course outline, list of lecture topics, schedules, references and further readings, methods of assessment and contact information. The forum provides platform for communication between lecturers and students as well as amongst students.

The objective of the study is to determine students' level of motivation in e-learning. This study considered motivation concept in three dimensions - intrinsic goal orientation, task value and self-efficacy. The learning strategies, measured by one large subscale relates to the use of strategies that help students control and regulate their own cognition in online learning.

Findings and Discussion

78 usable questionnaires were obtained from the survey. The respondents' mean age was 22 years, comprising of 46 females and 32 males, 71 (91%) Malays, 5 (6.4%) Chinese, and 2 (2.6%) Indians.

These students have varying experience in terms of frequency of involvement in online learning ranging from 0 experience - 5 (6.4%), one-time experience - 8 (10.3%), two times - 16 (20.5%), three times - 30 (38.5%), above three times experience - 18 (23.1%). From the 78 individuals approximately half of them had less than three times experience in online learning and half of them had more than three times. Most of the respondents spent an average of between one hour to three hours a week on e-learning. This study revealed that motivation towards online learning is at a moderate level (Table1). Motivation can be considered as an important psychological and critical condition for productive learning that explains students' performance and self-regulation strategies in online learning environment. Enhancing student motivation requires attention to the key features of the classroom learning environment that are likely to influence student motivation. Motivated students have the drive to succeed. Intrinsic goal orientation, task value, and self-efficacy for learning was found to correlate with learning strategies.

With the high level of independence and self-direction required of online learning, motivational factors are of great interest (Zimmerman & Kulikowich, 2016). The level of students' motivation and learning strategies are possible to be somewhat different for various classes (Hashemyolia, Asmuni, Ayub, Daud & Shah, .2014). A successful online learning environment provides platform for unlimited learners' virtual interaction and choice of learning strategies.

Table 1: Level of motivation towards online learning

LEVEL	Frequency	Percentage (%)	Mean	SD	Level
Intrinsic Goal Orientation			4.89	1.014	Moderate
Low	6	7.7			
Moderate	39	50.0			
High	33	42.3			
Task Value			4.96	1.061	Moderate
Low	6	7.7			

Moderate	38	48.7			
High	34	43.6			
Self-efficacy			4.74	.961	Moderate
Low	3	3.8			
Moderate	43	55.1			
High	32	41.0			

This study applied Pearson's product moment correlation to meet the research objective, which is to determine the relationship between learning strategies and the three subscales: instrinsic goal orientation, task value and self-efficacy. Guilford's (1973) Rule of Thumb was applied to interprete the strength of the correlation between variables. According to this rule, a correlation coefficient of below 0.20 shows a 'negligible' relationship'; 0.20 to 0.40 indicates 'weak relationship'; 0.41 to 0.70 means 'moderate relationship'; 0.71 to 0.90 shows a 'strong relationship'; and correlation coefficient of more than 0.90 indicates 'very strong relationship'.

Based on the analysis, it was found that all the independent variables had significant and positive correlation to the dependent variable (Table 2). Results of this test showed that all variables are linear. As shown in the Table 2, all three variables indicate moderate relationship with learning strategies. Furthermore , between the three variables the strongest linear relationship was found to exist between learning strategies and task value. (r = 0.681; n = 78; sig-p < .01). Meanwhile, the relationship between learning strategies and self-efficacy indicates moderate positive correlation coefficient (r = 0.636; n = 78; sig-p < .01). The relationship between learning strategies and instrinsic goal orientation shows moderate positive correlation coefficient (r = 0.609; n = 78; sig-p < .01).

Table 2: Inter-correlation of variables in relation to Learning Strategies

Variables		**Y**	**X_1**	**X_2**	**X3**
Y	**Learning Strategies**	1.000			
X_1	**Intrinsic Goal Orientation**	**.609****	1.000		
X_2	**Task Value**	**.681****	**.861****	1.000	
X_3	**Self-efficacy**	**.636****	**.804****	**. 904****	1.000

Task value is one of the factors that contributes to a strong relationship towards learning strategies. The task value depends on students' inherent interest (Zimmerman, 1990). Interest

and value of task relate to self-regulation. When the topic in online learning is perceived as interesting and important or useful for the students or is related to their tasks, they are more likely to use and adopt self-regulatory strategies (Pintrich & DeGroot, 1990). Like task value,self-efficacy too shows positive relationship towards learning strategies. Individual perception of self-efficacy is a critical element of motivation and academic success. Wang and Newlin (2002) found that both self-efficacy of learning course material as well as learning technological skills were predictors of learner performance. In agriculture sector, self-efficacy in technological skill is important in online learner success (Lynch & Dembo, 2004) to equip them with the capability to transfer knowledge as well as technology to farmers and extension agents. Students' goal orientations towards career path play a key role in self-regulation. They would eventually need skills to plan, set goals and deal with farmers, extension agents and agriculture agency. Set goals enable students to orient and direct their efforts to learning and understanding academic tasks as well as work tasks, developing new skills, and self-improvement (Eccles&Wigfield, 2002).

Based on the findings, this study yielded outcomes in line with other studies and confirmed that intrinsic goal orientation, task value and self-efficacy have positive relationship towards learning strategies in online learning environment. In order to engage and motivate students in online learning, self-regulated learning skill can be self-developed or be groomed through SRL practice. The success of online learning depends greatly on how actively engaged students are with the lecturer, with their classmates, with the content, with technology, and with course management tools. The students selected for this study are required to be trained in SRL carried out by online learning management. Through this approach students will be aware of the weakness and strength of their learning strategies and they know how to integrate different strategies at the different phases of the learning process. In other words, they should learn to learn. Students in online learning environment would need more SRL because of their flexible choice of time and place and resource information. In this situation students should be able to change their learning strategies based on their needs and learning environment.

Basically, one of the ways to create a successful e-learning environment is by facilitating students to use SRL strategies that could provide greater learner's interaction. The capability of learners in SRL strategies and controlling learning progress is essential in effective e-learning environment (Liaw & Huang, 2013). Lack of students' SRL and insufficient virtual

interaction may lead to students' dissatisfaction of the e-learning environment. Therefore this study attempts to find out factors that may affect students' SRL in LMS learning environment.

Self-regulated learning in terms of motivation strategies can be considered as an important psychological and critical condition for productive learning that explains students' performance and self-regulation strategies in online learning environment (Lee & Tsai, 2011). Hence this study aims to identify which factors within the learning environment that are likely to enhance student motivation and self-regulation. Consequently, the findings of this study may be useful in designing an effective learning environment that could enhance students' motivation to learn and to use the appropriate learning strategies in different contexts.

Conclusion

The findings show that participation in online learning amongst students linked with learning strategies is motivated by instrinsic goal orientation, task value and self-efficacy.

This study is important to understand the collaborative learning that can be achieved through rigorous interaction among students with the learning community, anywhere and at anytime, beyong the walls of classroom,made possible through online learning environment. Online learning provides modular and extensible system with adaptive and knowledge management abilities for students and lecturers.

Online learning as a supplementary mode of knowledge delivery has become increasingly important, complementing traditional classroom teaching. Motivation is a key factor to an effictive and successful online learning, in this respect to the agriculture undergraduates.

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An Innovative and Comprehensive Approach for Identification of Adopter Categories

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Several studies have been reported on the procedures and approaches to categorise adopters in various fields with widely varying output. Although most of these consider five adopter categories, there are reports with as less as two adopter categories (for example Early adopters and Mainstream adopters). Most of the attempts were innovation-specific albeit some have considered multiple innovations and have used composite scoring techniques. Adopter categorization in agriculture has to be multiple-innovations based as each farmer has to adopt many innovations in a crop, thanks to availability of number of technologies from multiple agencies (public and private) in a specific agro-ecosystem. Another major limitation observed in the adopter categorisation is that most of these have considered as the relative earliness as the sole criteria for adopter categorization. In reality, a late adopter for one innovation may be an early adopter for another. The late adopters, though knowledgeable, may delay adoption due to lack of resources. An attempt was made to rationalize categorization of these adopters using a two-stage classification. The first stage classification was based on relative earliness into innovators, early adopters and late adopters. In the second stage, based on knowledge level of the adopters on those innovations, Innovators were further classified as Innovators and Ignorant Adopters. Late adopters were further classified as Late Adopters and Informed Late Adopters. Average Knowledge Index was the highest for Innovators and least for Ignorant Adopters. There was difference in the average time taken from knowledge stage to implementation stage of innovation decision process among different adopter categories. The innovativeness score was higher among innovators and informed late adopters compared to late adopters and ignorant adopters.

Key words: Agriculture, Innovation, Adopters, knowledge index

Introduction

Farmers form an important component in technology transfer process. Among the four vital systems namely technology generation, technology dissemination, support and farmers system in technology transfer process, farmers playthe most important role as they make choice of the technology and decide to adopt or not to adopt the innovations. Rogers theory was widely used as the theoretical framework in technology diffusion and adoption (Dooley 1999; Stuart 2000).In the process of adoption, farmers pass through certain stages which Rogers described as innovation decision process (Rogers, 2003). According to him the time taken to pass through these stages varies from farmer to farmer depending upon the social system and attributes of an innovation. However, adoption of agricultural technologies and their diffusion in social system takes different time depending upon the communication channels and characteristics of the farmers. Most diffusion research has an inherent change bias as pointed by Rogers (1975). It assumes that innovations studied are good and should be adopted by all (Chamala *et al*., 1980).

Farmers efforts are directed to produce more, but that depends upon what he knows about the innovation besides availability and affordability of inputs. Knowledge of innovation is pre requisite for any decision (adoption or rejection). The traditional perception of diffusion theory of interpersonal communication (Mahajan *et.al*.,1990) should be extended to encompass social interdependence of all kinds. Rogers used mean and standard deviation of time taken to adopt the innovation for categorization in to five categories. We believe and it is accepted by many that categorization based only on one factor do not explain the field realities. Farmers who may take less time to adopt one innovation may not adopt another innovation or may adopt late. Such farmers can be placed as innovators for one innovation and laggards for another innovation. There is no general innovator or universal laggard for all innovations and over a period, as is often implicitly assumed by some diffusion researchers ((Chamala *et.al.* 1980). Hence, this study is an attempt to categorize farmers through a comprehensive approach.

Review of literature

The theory of rate of adoption suggests that the adoption of innovations is best represented by an s-curve on a graph. The rate of adoption amongst individuals differs throughout the social system. This starts slowly with only a minority of people adopting the innovation increasing over time eventually reaching the rate where enough individuals have adopted the innovation and the rate of adoption becomes self-sustaining.

It is generally known that all potential adopters of a new product do not adopt the new product at the same time. Consequently, based on the degree to which an individual is relatively earlier in adopting the new product, adopters can be classified into adopter categories (Rogers 1983). Using the mean and standard deviation of the time of adoption, adopters are categorized as innovators (<mean-2sd), early adopters (mean-1sd to mean-2sd), early majority (mean to mean-1sd), late majority (mean to mean+1sd), and laggards (>mean+1sd). Innovativeness or the relative earliness is the sole criteria for deciding a

farmer into these adopter categories. This is possible in innovation–specific categorization of farmers. Klein (2004) pointed out that Rogers' approach does not consider why laggards of certain technology might be early adopter of another technology. He pointed out that laggards should be divided into different categories but not the homogenous group.

Paul *et. al.*(2003) suggested two-level classification. At the first level, farmers were categorised either as front-runner or laggard. At the second level, front runners were further categorised into innovators and early adopters and the laggards were categorized into late adopters and non-adopters.

Tiana (2011) conducted the survey by asking few forced choice questions, each of which directly correlated to one of the categories from Rodgers diffusion of innovation theory (Innovators, Early adopters, Early majority, Late majority and Laggards) or Zollo(2004) teen/type categories (the Edge, Influencers, Conformers and Passive Teens). The categorization from two models previously mentioned were collapsed in to four, which combined two like categories, early majority and late majority, from the diffusion of innovations theory. The final four categories in order of their place in the diffusion chain were innovators, influencers,majority and laggards.

Zayem *et. al.*(2006) observed significant difference between early adopters and main stream adopters in terms of individual characteristics, adoption pattern, perception barriers and technology learning preferences.

Nityashree and Siddaramaiah (2003) categorized adopters in to four categories namely Pioneers, Rationalist, Imitators andMurmurs. The model has identified two groups of adopters on either side of the mean, the distribution seems to be equal, the model was named as PRIM (E).

Mahajan *et. al.* (1990) followed the Bass diffusion model and suggested five categories like that of Rogers. The time interval and the size of adopter's category depend on two parameters of Bass model the coefficient of external influence (p) and coefficient of internal influence (q).

Rogers model though explains the diffusion process and adopters categories for the large population, it suffers from certain limitations listed below:

1. The adopter categories have been made considering one innovation, but one farmer who is laggard for one innovation might be early adopter or late majority for another innovation. If we consider number of practices adopted for one crop, than categorization based on Rogers model is not possible.
2. Many studies also revealed that farmers designated as laggard not because he is traditional or lack knowledge of it, but he did not adopt for want of finance/ resources or favorable conditions (Chamala *et. al.* 1980).
3. In changed situation where technological development is faster, farmers decision is based on number of criteria or some time he is forced by input seller or private extension personnel to make use of new input without providing complete information or chance to evaluate the innovations.

Methodology

The study was conducted in Karnataka and Gujarat states on five crops – paddy, cotton, groundnut, maize and potato. Five important practices – variety/ Hybrid, micro nutrients, plant protection, irrigation and market were selected to study their adoption and diffusion process among farmers. Data were elucidated through observation and personal interview method from 736 farmers in 21 project villages during the cropping seasons of 2014 and 2015.

Table 1: Details of study area and sample of farmers

Sl.	Crop	Name of State	Name of District	Name of Taluk	Villages (No.)	Farmers (No.)
1	Cotton	Karnataka	Raichur	Devdurg	2	74
		Gujarat	Botad	Botad	2	75
2	Groundnut	Karnataka	Dharwad	Dharwad	2	81
		Gujarat	Junagad	Mendarda	2	62
3	Maize	Karnataka	Haveri	Haveri	2	77
		Gujarat	Panchmahal	Shehera	2	78
4	Paddy	Karnataka	Koppal	Gangavati	2	73
		Gujarat	Khed	Matar	2	69
5	Potato	Karnataka	Kolar, Chikkaballapur	Mulabagal, Chikkaballapur	3	80
		Gujarat	Banaskanta	Deesa	2	67
Total	**5 crops**	**2 States**	**11 Districts**	**11 Taluks**	**21**	**736**
					Karnataka State	385
					Gujarat State	351

Each farmer was visited several times during the cropping period to ascertain the innovations adopted on which the innovativeness related parameters were collected using structured and semi-structured interview schedules.Source of information and knowledge level on each innovation was obtained for each adopter.

Results and Discussion

Out of 736 respondent farmers,634 farmers (86.14 %) had adopted at least one innovation and the remaining about 14% were non-adopters. Most of these non-adopters were found in one crop - maize grown in tribal and rainfed villages of Gujarat. There were also non-adopters in paddy crop grown in one of the villages of traditional pattern in Gujarat and rainfed groundnut grown in Karnataka. Most of the farmers had adopted more than one innovation (Table 2). Number of innovations adopted differed between the States for the same crop and among the crops within a State. More number of innovations (more than two) was adopted in the case of commercial crops like cotton and potato as compared to food crops like paddy, maize and groundnut.

Table 2: Number of innovations adopted in each crop

No. of innovations adopted	Cotton		Groundnut		Maize		Paddy		Potato	
	Karnataka	Gujarat	Karnataka	Gujarat	Karnataka	Gujarat	Karnataka	Gujarat	Karnataka	Gujarat
Zero			9.9		6.9	97.4		30.0		
One			8.8		8.3	2.6		17.1	6.7	
Two	9.5		49.5		66.7		1.4	21.4	9.0	
Three	27.0	23.5	23.1	4.8	16.7		12.3	28.6	5.6	46.3
Four	27.0	22.4	7.7	33.9	1.4		35.6	2.9	12.4	43.3
Five	21.6	17.6	1.1	33.9			35.6		24.7	9.0
Six	9.5	15.3		24.2			15.1		14.6	1.5
> Six	5.4	21.2		3.2					27.0	

Farmers growing groundnut in Gujarat adopted more innovations (33.9 per cent farmers adopted 4 and 5 innovations each) as compared to Karnataka where majority (49.5%) adopted 2 innovations. On the contrary, paddy farmers in Karnataka adopted more innovations (35.6% farmers adopted 4 and 5 innovations each) compared to Gujarat wherein 17.1 per cent used one innovation, 21.4 per cent adopted two innovations and 28.6 per cent adopted 3 innovations. The results further revealed that over off 50 percent of innovations in Karnataka (53%) and Gujarat (37%) were related to plant protection chemicals followed by variety/hybrids (28 and 31%), irrigation (3 and 15%) and micronutrients (59 and 2 %). More chemicals are used in cotton and paddy in Karnataka, whereas more varieties were grown by farmers in Gujarat.Variety /hybrid, nutrients and plant protection chemicals were adopted by over 90 percent of the farmers. Potato and cotton which are high value crops required higher investment. Hence farmer's involvement is higher as well they make effort to understand about innovations. The pooled data of number of innovations used in the five crops and five functional areas (seed variety/hybrid, irrigation, micronutrient, plant protection chemicals and marketing) revealed that majority of the farmers used about 2 to 5 innovations in both the states. Less than ten percent of the farmers adopted 6 or more than 6 innovations in both the states (Fig 1).

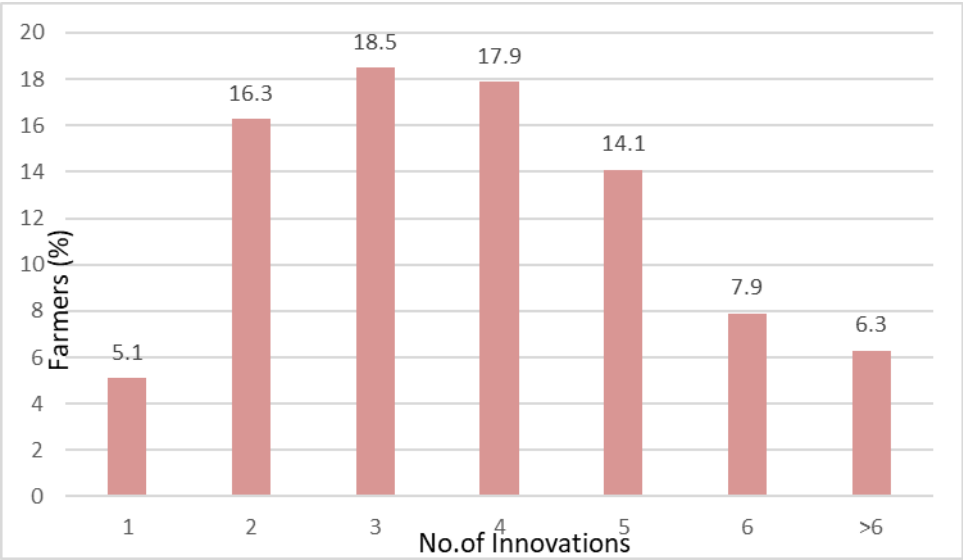

Figure 1: Number of innovations adopted by farmers

Some of the innovations were adopted by majority of the farmers within 3-4 years, while some innovations had taken more than 10 years to diffuse among majority farmers in the village. Hence pooled relative earliness was attempted as the basis of categorization in the first stage as detailed below:

Step 1: For each innovation adopted in the village, farmers were listed and sorted chronologically based on the time (year and month) of adoption of the innovation for the first time.

Step2: Relative earliness (R_{XI1}) of farmer 'X' for innovation 'I_1' in each village indicates the number of months farmer X is earlier than the last adopter for the same innovation in the village. It was worked out by using the formula:

$R_{XI} = T_{LI1} - T_{AI1}$

where T_{LI1} is the time (year & month) of adoption of 'I_1' innovation by the last adopter in the village and T_{AI1} is the time of adoption (year & month) of farmer 'X'.

Step 3: Relative earliness of 'X' farmer was converted into unit scores (Z_{XI1} = Unit scores of earliness of X farmer for 'I_1' innovation) by using the following formula:

$Z_{XI1} = R_{xI1} \div R_{EI1} - R_{LI1}$

Where R_{EI1} is the relative earliness of first adopter(s) of 'I_1' innovation and $R_{LI1}$is the relative earliness of the last adopter of 'I_1' innovation in the village. The unit scores range from 0 (last adopter) to 1 (first adopter) for each innovation in a village.

Step 4: This process is repeated for the 'n' innovations adopted for each crop by the farmers in five functional areas of the study. Sum of relative earliness unit scores of a farmer divided by the number of innovations adopted gives the average relative earliness unit scores for each farmer.

Step 5: Average earliness index of a farmer 'X' (AE_X) for 'n' number of innovations was obtained by using the formula:

$AE_X = (\sum Z_{XI1..} Z_{XIn})*100 \div$No. of innovations adopted by the farmer 'X'.

Using the mean and standard deviation of Average Earliness Index for all the adopters and for all the innovations adopted, all farmers were categorized into innovators (>mean+SD), early adopters (mean-SD to mean+SD), and late adopters (< mean-SD). Accordingly 35.9% of the farmers were found in Innovators category and 27% in Late Adopters category.

During the investigation some farmers reported that they had adopted innovations with limited or no knowledge of the innovation and a few others had deliberately resorted to late adoption as they had better alternatives at that point of time or the need didn't arise to use the innovation. Hence it was felt essential to make second-stage categorization based on knowledge of innovations as it has critical implications on the consequences of innovation adoption. Adopters knowledge of innovations at the time of adoption was measured on a three-point continuum as "didn't know", "partially knew" and "completely knew" of innovation and score of 0, 1 and 2 respectively were assigned. Average knowledge index score for each farmer was worked out by pooling the knowledge scores and dividing by the number of innovations adopted.

Based on mean and standard deviation of average knowledge index value, Innovators were further categorized as "Innovators" and "Ignorant Adopters" (early to adopt, but without knowledge of innovation). Further, late adopters were sub-divided into "Late Adopters" and "Informed Late" Adopters ((late, but knowledgeable, deliberate late adoption). Finally, apart from 13.9% non-adopters, five adopter categories were made and the percentage of adopters in each category is given in Fig 1.

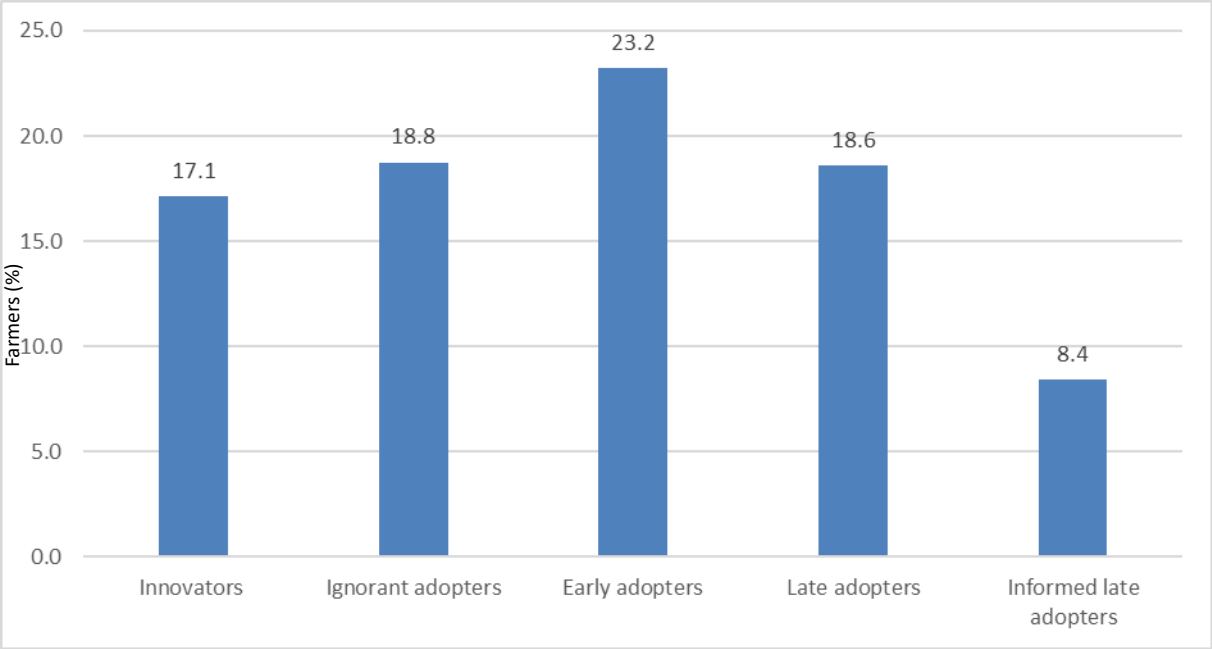

Figure 2: Distribution of Adopters (%) into five adopter categories

Conclusion

Innovation diffusion has been studied in all fields and areas with varied purpose and focus. Faster emergence of innovations on one hand and competition among farmers to harvest more are apparent during recent times. Revolution in information technology and globalization in trade has hastened the flow of innovations. Adopter categorization is mostly innovation-specific although adopters rarely adopt a single innovation in managing their business or profession. Knowledge of innovations has been widely accepted as the starting point of innovation decision process. However, knowledge has never been the basis of adopter categorization. Considering multiple innovations and knowledge of these innovations as the basis, an innovative method of adopter categorization has been presented. The suggested methodology is a guide to categorize farmers and helps in designing appropriate extension strategies to faster dissemination process. Methodology is applicable across disciplines and is easy to adopt. New adopter categories have relevance for targeting extension delivery, both to improve effectiveness and to do so with efficiency.

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Extension Model for Broiler Farmers In Partnership System In Malang Regency, East Java Province, Indonesia

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Broiler partnership system between nucleus and plasms is the main farming method in increasing broiler population and in empowering its farmers in Indonesia. Malang Regency as one of potential area for broiler farming also adopts this partnership system. There are about 17 nucleus that operates in Malang Regency. Empowerment is considered as the main target of partnership system which undertaken by nucleus technical support who delivering extensions regularly to farmers. However, empowerment faces many obstacles. The objectives of this study were to explore the extension model for broiler farmers as plasms in the partnership system and to spot some areas which can be developed in the model by enhancing communication process. The research was undertaken from August to September 2016. The research was descriptive qualitative method with case study approach. Key informan were 4 technical supports from 4 nucleus, 7 broiler farmers, and 4 extension officers from feed miller. Participant observation was done to get data. The study showed that although the extension model in broiler partnership is aimed to empower the farmers, it actually still adopt programme learning model. There are a lot of conditions that affect the implementation of empowerment extension model. Communication can be a tool to reach empowerment in partnership system. The conclusion is one way to develop the model is to redefine the objective of extension in partnership system and to enhance communication process between nucleus and plasms.

Keywords: *Empowerment, programme learning model, communication process*

Introduction

Partnership system in broiler farming was to established to empower smallholders farmers in Indonesia. Based on Indonesian General Stipulation Section 1 Verse (8) Act No. 9 1995, partnership between smallholders and middle or big industry have to be along with sustainable construction and development efforts, based on interdependency, mutual strengthening and profitably for both parties. These principles brought out into several activities, including non-formal education by nucleus/middle-big industries (feed millers) to broiler farmers. Non formal education is important since President Decree No. 22 2002 stated that Indonesian government no longer regulating farming scales into different range (small-middle-big scales). It means government does not support small scale farmers anymore and hand over broiler industry to market mechanism. Small scale farmers who cannot survive competition should seek partner to support their farming continuance. Middle industries (local integrators) and big industries (feed millers) as their partners are obligated to give non formal education for small scale farmers who cannot enter formal education but need

guidance in farming management. This is appropriate with Bessete & Rajasunderam (2006) statement that the concept of non-formal education refers to organized and structured educational activities designed for the benefit of a specific target group, which take place outside the official educational system. Non formal education seeks to make contact with people who do not normally have access to educational and training structures. In the broiler partnership system, the final objective of this non formal education is both parties can gain mutual benefit. Small farmers are expected to get higher bargaining power and to empower themselves within broiler industry competition.

Non formal education carried out by local integrators (in partnership system called as nucleus) and feed millers then formed into extension. In practice, this extension unavoidably has special features since it involves parties' interests especially in profit gaining. It affects how actors treat the message in the extension communication process. Communication is the important activity in the empowerment effort since it is needed to raise target awareness about their condition. Rubin and Rubin (2001) stated that the initial step in building personal empowerment takes places as people recognize that they are victims of problems that are shared by many others. This recognition occurs when people get together, talk about what bothers them and share experiences of oppression. In these discussion-*consciousnesses raising session*-people discover that their personal problems are caused the broader social structure and occur because they redound to the advantages of others. Thus, in the extension of broiler partnership system communication process must be aimed to make farmers aware that they have bargaining power problem in the partnership system.

The research was done in Malang Regency which has 18 major player nucleus or local integrators. These nucleuses are supplied by 7 well known feed millers (Charoen Pokphand, Japfa Comfeed, Wonokoyo, Anwar Sierad, Cargill, Malindo, and New Hope). Malang Regency was chosen as research location based on the several reasons: (1) market analysis showed that Malang Regency position at the fourth rank in East Java Province; (2) Malang Regency has highest number of local integrators compared with other areas in East Java, and (3) broiler farmers are distributed vastly, thus Malang Regency has many local challenges variations (namely, topography, temperature and humidity). These local challenge differences affect communication process in the extension and the contract making. Thus, the objectives of this study are to explore the extension model for broiler farmers as plasms in the partnership system and to spot some areas which can be developed in the model by enhancing communication process.

Methodology

The research was done in Malang Regency, East Java, Indonesia from August to September 2016. The research used descriptive qualitative method with case study approach. Key informan were chosen purposively who considered as main sources of information in the extension broiler partnership system. Key informan were taken from 4 nucleus which are supported by Charoen Pokphand, they are IP, TJS, SSS and Sawahan Poultry Shop. Four technical supports from each nucleus, 7 broiler farmers/plasms and 4 extension officers from feed millers were asked to be key informan. Key informan were 4 technical supports from 4 nucleus, 7 broiler farmers, and 4 extension officers from feed millers in Malang Regency.

Data collection was using in depth interview and participation observation. To analyze data, inductive analysis with Miles and Huberman analysis model was used.

Discussion

The discussion is divided into two sections; first section describes the extension model that carried out by nucleus that operates in Malang Regency. The second section explains the communication process as empowerment tool in broiler partnership system.

Extension Model in Broiler Partnership System in Malang Regency

Based on the Indonesian government regulation, extension in the broiler partnership system is mainly aimed to empower farmers. However, in the same time extension for broiler farmers in partnership system is used to keep farmers attaching to the nucleus to get best profit. This condition compels nucleus to apply extension model that is not aligned with partnership objective to empower plasms/farmers.

Coutts and Roberts (2003) mention some models of extension:

1. **The group facilitation/empowerment model:** This model focuses on participants increasing their own capacity in planning and decision making and in seeking their own education/training needs based on their situation. Groups may undertake their own research. The project will often provide or fund a facilitator to assist groups to define their own goals and learning needs and to help them realise these.
2. **The technological development model:** This model is about individuals working together to develop specific technologies, management practices or decision support systems which will then available to the rest of the industry or community. It often involves local trials, demonstrations, field days and on-site visits.
3. **The programmed learning model:** This model is about delivering specifically designed training programs/workshops to targeted groups of landholders, community members, government personnel and others to increase understanding or skills in defined areas. These can be delivered in a variety of models and learning approach.
4. **The information access model:** This model is about providing a range of blanket information that individuals and groups can access from a distance and at time that suits them. It can be based on a web-site, information centre and other centralised locations.
5. **The personalised consultant model:** This model recognises the interaction between mentor or consultant who works over time with an individual or community to improve their managerial, technological, social or environmental situation – or individuals from different backgrounds working in a 1:1 basis.

Nucleus and plasms communication in the extension actually influenced by their effort in lessening each other domination. Both parties in partnership basically have an interdepence relationship to maintain their business running. Under indefinite agriculture policies such as corn import-export and DOC supply limitation policies, both struggle to get maximal profit. Using Coutts and Roberts' models of extension (2003) descriptions it can be said that the extension model in broiler partnership system Malang Regency uses *the programmed learning model,* the reasons are : 1) the training are specifically designed for broiler farmers who join the partnership system (plasms); 2) training programs are delivered in varying learning approach, such as farm visit, group discussion, seminar, and home visit , and 3) the aim of the training/seminars is merely to increase the knowledge and the skills in

broiler farming management (feeding, housing, disease handling, bio security, vaccination). This programmed learning model cannot facilitate broiler farmers to empower themselves. Because it only targeting on increasing farmers' ability in farming management. Whereas empowerment program should make farmers be able to participate actively in the partnership system (especially in situation analyzing, problem solving and contract making).

Communication Process as Empowerment Tool in the Extension of Broiler Partnership System Servaes (Scrampickal, 2006) states that development communication models differ based on how the nation define what is development and the strategy to attain it. Empowering community through development communication aimed to make the target to realize development problems in their environment, to be aware of the conflict of interest among them, to learn finding solution and its alternatives for their problems and technically-they can facilitate their community with equipments to solve problems (Srampickal, 2006). The essence of communication in broiler partnership system extension is to aid nucleus empowering its plasms. Through extension, broiler farmers are able to deliver their expectation and participate in the contract making. This communication process should bring congruity between the objectives of partnership program and both parties needs.

Source. Communication in the paradigm of empowerment has the locus control in this process rests with the individuals or groups involved and not with the experts, the DSC (Development Support Communication) professionals or sponsoring organizations. While professionals must have a role to play in designing intervention strategies, they are not the key actors. The key players are the people handling their problems in local settings and learning and honing their competencies in the concrete experiences of their existential realities (Melkote and Steeves, 2001). There are two sources in the broiler partnership program: nucleus/local integrator officers and professionals from feed miller. They act as a message transmitters in the communication process and to handle farmers' problems.

Nucleus/local integrator officers' main tasks are to help farmers solve their problems and to make sure that farmers do not have any intention to leave the partnership system. From the interview with nucleus officers and farmers, it was found that sincere attention is the most important thing to keep a good/personal relation with consumers/plasms. This job is quite hard because one officer handles about 100.000 chickens population. Farming scale in Malang Regency for each farmers range between 5.000-10.000 chickens, so every nucleus officer must serves 10-20 farmers. To get maximal communication process, nucleus officers has to meet farmers frequently (minimum once a week) to give technical guidance and to build personal relation. High frequent visit tends to keep consumers/plasms stay longer in the partnership.

Seminars for farmers are held by the nucleus officers by inviting professionals from feed miller. Usually, these professional serve the seminar as a team consists of animal health, nutrition, and production experts. Although these seminars actually are very rare (about once or twice a year), but it is effective to maintain good relationship between feed miller and its consumers.

Other parties in the extension are academicians and government. Sometimes academician is involved in the seminar to give materials as his/her community service or as

part of his/her research. Government is considered as decision maker but seem to give authority to feed miller to control the system, namely feed price, DOC supply and broiler meat price in the local area. Government interference in technical management emerge when something extremely endanger economic condition but never down to farmers level.

Message. Education is a process that conveys messages of communication that enable empowerment subject to know and to realize their quality of life. Mardikanto (2010) says education process can raise people awareness about what they need to improve their life. If people get proper education, then it will be followed by amelioration of accessibility, action, organization, business, income, environment, and community. Non formal education in extension also has similar objectives for farmers. Education in broiler partnership system must promote farmers' awareness about broiler industry as a system so they know their position and able to define the most appropriate farming strategy for themselves. However, in the extension of broiler partnership system, non-formal education for farmers is not conveying this idea. Extension done by nucleus officers contains only a conventional basic materials/on farm management or schedule for vaccination, harvesting and medication. In fact, nucleus officers said that mostly personal and general issues for experienced farmers more important than those materials. Most of farmers said that the nucleus guarantee for on time harvesting. In this process, farmers mainly referring to input quality complaints and several questions about farming management.

Extension materials brought by professional from feed millers mainly about recent and general issues in broiler farming and industry. It also contains promotion of certain products that play along with nucleus in equipping farming input. Actually these technical messages make farmers more depend on the nucleus to solve their daily problem, but never solve their real problem. It is not designated to empower farmers to face the core problem in the broiler industry. Overall it can be seen that extension systems in the broiler partnership program need to be (and are) versatile to deal with the diversity and complexity that is the context in which they operate.

Some low to medium scale farmers mentioned a specific situation how nucleus interacts with big scale farmers. Nucleus tends to give more intensive extension for big plasms, especially for complains handling such as feed composition consulting, feed and harvest scheduling. The more two ways traffic communication between big scale farmers and nucleus was likely allows big scale farmers to get better facilitation than small/medium scale farmers. But for few small and medium farmers who have more frequent contact with nucleus officers, they usually get support and recommendation when applying credit from bank.

Channel. Dialog between farmers and stakeholders occur between farmers-nucleus officers and farmers-professionals from feed millers. Dialog between farmers and nucleus officers usually held minimum once a week. These processes are carried out by unmediated personal and mediated communication through phone, SMS and social media (WhatsApp, BBM). While communication between farmers and professionals from feed millers are organized as seminars that take place in hotels or farmers houses.

In connection with empowerment as the goal of communication in partnership system, these communication channels are not considered effective to empower farmers. Melkote &

Steeves (2001) stated that in the approach of communication that deliberate people from their dependent and exploited status, communication channels are used to generate dialogue, to help people understand each other and identify their collective problems. Hence, communication is performing its true function – *communicare* or building commonness among the members of group or community striving to change their present situation. In this case, unmediated personal and mediated communication between farmers-nucleus cannot support effective dialogue because most nucleus officers have to serve too many farmers in the same time. Farmers only get a short visit from officers and mainly they talk about personal issues and technical farming problems. It rarely focusing on the more important matters, such as contract amelioration and better communication management between two parties. Seminars from feed millers' professionals are not effective either because they are held very rare, only once or twice a year. It also found that there was difference treatment in giving services to different scale of farmers. For some big scale farmers, these professionals usually give extra services. Big scale farmers can ask them to come to their place and to provide group meeting or personal consultation. Unfortunately, small-medium farmers are difficult to get this special treatment. It implies a poor trust condition between farmers and nucleus. Farmers then tend to not believe nucleus' information (especially about market price, government policy) and to convey their all problems to nucleus (and feed millers).

Receiver. The receivers of extension and the target of empowerment in the development program for partnership system are broiler farmers. Perkins states that empowerment occurs when ordinary people discover that they have the capacity to solve the problems they face, control the means to do so, and have final, authorities sat in decision making (as cited in Rubin & Rubin, 2001, p. 77). If Perkins definition is used, then the empowerment for farmers has not been fully gained. All the decision in the partnership system are controlled by nucleus and farmers get the final contract without participating in the contract making. Instead of deciding for themselves, farmers tend to follow nucleus needs, in terms of contract making, input choosing and harvesting schedule. This condition actually creates financial loss risk for both parties because it encourages farmers to cheat on input using. Farmers buy lower quality feed from other parties to reduce feed cost or even sell the feed to 'special' buyer. Nucleus then lost some of their profit and farmers get lower harvest quality.

Enhancing farmer's empowerment in the communication process must be started by improving partnership system itself. Empowering partnership system should be unbiased to political interest, so further government interference by creating proper policy is needed. This is suitable with Conger and Kanungo statement that although the practice of empowerment is effective for the removal of powerlessness, certain factors still exist that may inhibit empowerment. These factors include organizational aspects, such as an impersonal bureaucratic climate(s), supervisory styles described as authoritarianism and negativism, and arbitrary reward systems (as cited in Hur, 2006). In broiler industry, government should help maintain feed materials price (especially corn price) and DOC supply stability. These are two main problems that fail empowerment in the partnership system since farmers tend to change partner every time the contract is not satisfied them. The data showed that most farmers also change partners less than 5 years because of broken contract. When government able to make

a good condition for broiler industry and to interfere without any depraved interest, empowerment for farmers will be easier to conduct.

Conclusion

It is important to develop the extension model by redefining the objective of extension in partnership system. The group facilitation/empowerment model is one of alternative that could be applied in the partnership system. To enhance communication process between nucleus and plasms, it also needs the government interference in the broiler partnership system.

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Extension Workers' Perception of Organizational Climate and Job Satisfaction in Agricultural Organization in Iraq

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Organizational climate and job satisfaction are known to be good and significant precursors of job performance in any organization. This is because they give the employee the stability and motivation to discharge his responsibilities efficiently. Agricultural extension employees are responsible for the provision of services and dissemination of information and knowledge to farming communities in Iraq and most other developing countries. Their perception of organizational climate and job satisfaction is poorly researched and therefore the major indicators to job performance may not be known, let alone their relationship be determined. This research work therefore looked at the perception level of these significant indicators to establish the viewpoint of the extension worker on his work environment. The sample size of 180 was taken and extension workers were blocked in the headquarters during the annual training session in the first quarter of 2016 and administered questionnaire. Data collected was analysed using descriptive statistics of percentages and frequencies. Results revealed that most of them were male (58.33 %) and have college degrees (75.00%) and are relatively young with a lot between the age of 21-30 years (75.00%) and within their first five years of employment (51.67%). The perception level for both job satisfaction and organizational climate are both at moderate level (72% and 69 %) respectively. It can be concluded that there is a great potential for the extension workers in Iraq to perform efficiently if their young age and good qualification can be leveraged on and their organizational climate condition be improved for increased motivation and job satisfaction to above moderate level.

Keywords: Organizational Climate, job satisfaction, job performance, agricultural extension workers

The role of agricultural extension in any socio- economic development of farmers and agricultural livelihoods and by extension the agricultural development of nations cannot be over emphasized. It has been described as a cardinal pillar in agricultural sector and as such development will only be achieved with a strong and virile agricultural sector (Chikaire, Ani & Atoma, 2015; Muktar, Ahungwa, & Nasiru, 2016). It has been established that no nation had real growth in the agricultural sector without effective extension service (Lafta, Salih, Nerina, & Yusof, 2016).

Contingent upon realizing these developmental goals, though is the effective discharge of job performance by the extension agents and the provision of a favourable and encouraging

organizational climate for them to operate. As such, researches that focussed on organizational climate and job performance have been carried out in many countries across different organizations like universities (Adeniji, 2011; Jyoti, 2007) business environment (Asif, 2011) with hardly any done in Iraq establishments, particularly agricultural extension organizations (Lafta et al., 2016).

The desired improvement of productivity and consequent agricultural development in a country is heavily dependent upon the extension workers performance while his performance is linked upon the organizational climate (Ghosh & Vijayaragavan, 2003). This research set out to find the perception of the extension workers on the organizational climate they operate within and also describe how they rate their job performance in that environment. Therefore the objectives of this research are:

i. To describe the socio-economic variables of the agricultural extension workers
ii. To describe the perception level of organizational climate by the extension workers in Iraq
iii. To identify and describe the Job satisfaction level of the organization employees

Methodology

This study is taking a quantitative approach, hence a structured questionnaire was used to collect data from the respondent. The study area is Baghdad city in Iraq due to the fact that the higher concentrations of extension workers are found in the headquarters and training centres are in Baghdad. The choice of organizations was purposively targeted at the agricultural extension agencies, since the research is aimed at identifying the perception of organizational climate and job performance of extension organizations by agricultural extension workers. Extension workers were blocked in the headquarters between January and March during the annual training session every year in the first quarter. The questionnaire was administered and retrieved within the week long training session, using the total population of agricultural extension workers of three hundred and sixty. The Kcjerie and Morgan table was used to get the sample size of one hundred and eighty six respondents for the study. Fifty percent of the extension workers were administered questionnaires randomly. Hence In the general headquarters a total of one hundred respondents were randomly selected and another forty two from the training centres and thirty eight from the farm centres.

Results and Discussion

Table 1: presents the socio-economics characteristics of the extension agents in Iraq. The majority of the agricultural extension in Iraq were found to be male (58.33 %) and about (41.67%) are found to be female. This is a clear reflection of what is obtainable in developing countries. The age category analysis shows that majority of the extension workers are within the age group of 21-30 years (75.00%) which indicates that the work force is of young and agile personnel and thee is a good prospect for good job performance since age is an indicator of good performance. The educational level of the extension workers is seen to be having an impressive number of graduates, about 75% of them. Years of experience is seen to be

mainly 1-5 years (51.67%). This indicates that most of the farmers are at their prime age of employment, meaning they have a lot to contribute to their organizations.
The concentration of young and agile early years of employment has a great potential to the job performance of the extension agents if utilized and provided a good organizational climate to function.

Table 2: the table shows the perception level of the organizational climate of extension workers in the extension organizations in Iraq. Majority of the extension workers (72%) are seen to have a perception that the organizational climate to be of medium level. This indicates a fairly moderate atmosphere of working condition, however, with some room for improvement. The medium level has implication on their job performance; this is because it has been found that organizational climate is among the significant factors that influence job performance (Jyoti, 2007; Lafta et al., 2016; Mishra, Chandargi, & Hirevenkanagoudar, 2011).

Table 3: depicts the job satisfaction level of agricultural extension workers in Iraq, majority of them indicate their satisfaction level to be at medium with (69 %) of them indicating medium job satisfaction. The percentage of the employees that are highly satisfied with their job are only 14% of the total respondents. This means that most of the employees are having a medium level of satisfaction of the job. Job satisfaction has been alluded to be a good indicator of job performance as individuals that like and are satisfied with their jobs are inclined to perform higher. In a research done on university lecturers in Nigeria this fact that job performance is positively related to organizational climate has been established (Adeniji, 2011; Omolayo & K. Ajila, 2012)

Conclusion

Majority of extension workers in Iraq are found to be well educated, relatively young and with a good number of years to put into service as most of them are within their first five years of employment. The extension workers perception was analysed and it was found that most of them, indicated a moderate level of the organizational climate and job satisfaction. The majority feels that both are at moderate level, therefore can be improved to a higher level.

Table 1: Socio economic characteristics of extension workers in Iraq

Variable	Frequency	Percentage
Gender		
Male	105	58.33
Female	75	41.67
Age Category		
21-30 Years	82	45.56
31-40 Years	52	28.89
41-50 Years	25	13.89
51-60 Years	17	9.44
More than 61 Years	4	2.22
Educational Level		
Secondary School	14	7.78
Diploma	23	12.78
Degree	135	75.00
Masters	4	2.22
Ph. D	4	2.22
Years of Experience		
1-5 Years	93	51.67
6-10 Years	49	27.22
11-15 Years	14	7.78
16-20 Years	7	3.89
21-25 Years		
Total	**180**	**100.0**

Table 2: Perception Level of organizational climate by the extension agents in Iraq

Level	Frequency	Percentages
Low	22	12
Medium	129	72
High	29	16
Total	**180**	**100**

Table 3: Perceived job satisfaction Level of extension organization employees

Level	Frequency	Percentage
Low	30	17
Medium	125	69
High	25	14
Total	**180**	**100**

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In-Service Training Needs of Agricultural Extension Personnel Associated with Climate Change Adaptation in Malaysia

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The study is aimed at describing the perceived importance of, and proficiency in, climate change related competencies among extension personnel; and evaluate the resultant training needs. The study randomly sampled 328 extension personnel from six states of Malaysia. Cross-sectional data was collected using structured questionnaire that was reviewed and pre-tested for validity and reliability. Analysis was conducted using SPSS. Descriptive statistics including the mean weighted discrepancy score were employed in the analysis. The Borich's Needs Assessment Model was adopted for the study. On a scale of 5, the most important perceived climate change competency items are: communicating climate information effectively (M=4.73, SD=0.75), using ICTs in climate change adaptation (M=4.70, SD=0.53), and promoting eco-friendly agronomic practices and farming system (M=4.67, SD=0.61). The competencies with the highest proficiency scores were: promoting cultivation of improved crop varieties (M=2.43, SD=0.77), planning climate resilient development (M=2.33, SD=0.80), capacity to build linkages among stakeholders (M=2.33, SD=0.76). Training needs for extension personnel are highest in: communicating climate information effectively (MWDS=12.49), use of ICTs in adaptation (MWDS = 12.22), promotion of eco-friendly practices and systems in agriculture (MWDS = 11.67), and impact of climate change on urban development (MWDS=11.19). The study evaluated the gap between what extension workers know and what they should know in issues of climate change to facilitate adaptation. It is recommended that any training programme in the area should prioritize these competencies to enhance personnel capacity as they tackle climate change in collaboration with the farmers.

Keywords: agricultural extension, climate change, competency, Malaysia, training needs

Despite the declining contribution of agriculture to the Malaysian economy, the sector remains vital in socio-economic and strategic issues. It continues to play important roles in poverty alleviation, food security, income distribution, and balanced and sustainable development (Tawang, Ahmad, & Abdullahi, 2001; Umar, Man, Nawi, Samah, & Umar, 2016). Almost 90% of Malaysian farmers in the food sector are operating on small-scale from small-size farms, battling high cost of production inputs and experiencing low yield with low produce quality. Hence, the government's policy towards agriculture stresses increasing production to achieve food self-sufficiency through interventions such as fertilizer subsidies

to increase production and improve income. These efforts for producing sufficient food and fibre for self-sufficiency resulted into an intensive agricultural system affecting the environment negatively (Tiraieyari, Hamzah, & Samah, 2014).

Weather and climate play important roles in determining agricultural productivity including the seasonal variability and the spatial patterns of global agriculture. The climate of Malaysia is typically tropical with high temperature, humidity, rainfall, and cloud cover all the year round accompanied by small seasonal variations in solar radiation. Environmental stresses such as flood, drought, high temperature, and other extreme situations are major limiting factors to crop productivity in the tropics. An evaluation of the impact of these climatic stresses on crop productivity assessed using morphological, physio-biochemical and yield responses revealed that climate variability does indeed affect the agricultural sector in Malaysia. The effects of such variability threaten food security and the contribution of agricultural sector to the national economy. Significant weather and climate variations have impact on productivity and land use patterns (Tawang et al., 2001). Moreover, the impacts vary across geographical locations because of high variation in elements of weather and climate, especially rainfall, even among relatively close locations (Alam, Siwar, Talib, & Toriman, 2014).

The capability of extension personnel to effectively direct the clientele from the stage of awareness to sustainable adoption of improved technologies and practices depends largely on his/her training and expertise in agriculture and extension methods. Since it is the responsibility of the extension worker to reach the farm households and convince them to adopt innovations for improved livelihood, it is therefore imperative that extension training and capacity building is an integral part of agricultural production process and determinant of productivity (Ovwigho, 2011). The vital role of extension personnel as linkage among various agricultural stakeholders emphasizes the need for regular assessment and analysis of their technical competence and performance capacity (Adisa & Balogun, 2012). Moreover, Considering the place of sustainability in agricultural and development circle, extension and advisory personnel are expected to be well equipped with the capacity and knowledge of climate change for transmission to the diverse farmer population (Alibaygi & Zarafshani, 2008).

Training can be broadly classified into two types: pre-employment training and on-the-job training. Pre-employment training denotes the type of training provided to an individual who has tentatively chosen a carrier or vocation but needs basic competence to function effectively. As the name implies, it is the kind of training undergone in schools and colleges before employment. On-the-job training, on the other hand, refers to the type of training offered to an employed individual who requires certain skills to function efficiently, for instance, due to changes in technology. Examples of on-the-job training include in-service and induction courses. This study is concerned with already employed extension personnel, hence it evaluates their in-service training needs.

The term "training needs" has been used to refer to the gap between the current level of skills or competencies possessed by the individual and the expected level of such competencies to be attained by the individual for effective discharge of duty (Ovwigho,

2011). Similarly, a training need can be conceptualized as the discrepancy between an educational goal and trainee performance in relation to the said goal (Borich, 1980b). While the process of identifying such needs can be conceptualized as a discrepancy analysis that identifies the two polar positions of "what is" and "what should be" (Borich, 1980a). Likewise, training needs have been defined – in a study of state vocational rehabilitation counsellors in the United States – as the difference between the perceived importance and the perceived preparedness of the competency items on the measurement instrument. According to Wright & Geroy (1992) majority of theorists in the field of training defined "needs" in reference to the equation:

Training needs = Standard or desired performance – Present or actual performance

Technical skills and competencies for extension field workers vary according to area of specialization (Suvedi & Kaplowitz, 2016). Special contexts and/or phenomena (such as environmental changes, famine, or natural disaster) usually require such specialized competencies. After reviewing previous studies, in this study, training need is considered to be the gap between the perceived importance of climate change competency and the perceived proficiency/ability in that competency. Despite the proven efficiency of the B-NAM in measuring training needs, there is dearth of literature showing its application in the agricultural extension systems of agriculturally-reliant developing countries such as Malaysia. Also, the model has enjoyed more patronage in pedagogical circles than in the extension/advisory services areas which is more of andragogy. This calls for the need to use a modified version of the model in evaluating such an important and timely issue as the training needs of extension personnel on climate change in Malaysia.

The aim of this study is to identify and prioritize the training needs of agricultural extension personnel on competencies associated with climate change in Malaysia. The specific objectives are to: describe the perceived importance of climate change related competencies; describe the perceived proficiencies in climate change related competencies; and evaluate the training needs of agricultural extension personnel in climate change related competencies.

Climate change has been adversely affecting mankind and their sole source of food and fibre. There is need for the producers to have the adequate knowledge and information for reduced vulnerability and enhanced resilience to the climate change phenomenon. However, the major channel via which this information reaches the farmers is the extension agents (EAs). Hence, there is the need for the EAs to have the competent knowledge of climate change and also the requisite capacity to pass it to the beneficiaries. This calls for training of EAs to be able to meet the expectations of their job and attain satisfaction. According to Guthrie & Schwoerer, (1994), to justify huge investments in employee training programmes by organizations there is need to accurately assess their (employees') training needs.

Methodology

This study is descriptive and employed the cross-sectional design whereby only one contact with the subjects/respondents was required, unlike before-and-after (two contacts) and longitudinal (three or more contacts) studies. Furthermore, non-experimental method of investigation will be adopted (Kumar, 2011). The instrument to be employed in this research is a self-administered questionnaire. Drop-off and pick-up method was used in the distribution and retrieval of the questionnaire.

Questions (items) on climate change related competencies were based on literature including from World Meteorological Organization (WMO)'s climate services competencies and the United Kingdom Department for International Development (DfID)'s climate and environment advisers competency framework (DFID, 2011; WMO, 2016). A separate sample of thirty (30) respondents with similar characteristics as the sample of study was selected and the questionnaire administered. The pre-test respondents were asked to highlight any aspect of the questionnaire that is ambiguous, inadequate, unclear and/or too sensitive (Ary, Jacobs, Sorensen, & Walker, 2014). Subsequently, the problem areas were identified and adjusted accordingly. The final version consisting of 31 competencies was distributed to the respondents. Likewise, the competency instrument used double matrix to minimize confusion, heuristics and respondent fatigue (Borich, 1980b; Mckim, 2013). Items were used to measure level of perceived importance on a five-point scale anchored as: 1= very low importance, while 5= very high importance. The same items were used to measure level of proficiency in the competency areas with similar point scorings, thus: 1= very low competence and 5= very high competence. For the climate change-related competency the reliability for importance was .77, while that of proficiency was .84. The values obtained were similar to previous findings in the field (Alibaygi & Zarafshani, 2008; Elhamoly, Koledoye, & Kamel, 2014).

The population studied was made up of all public extension personnel in Peninsular Malaysia. Malaysia has a total of 1,307 extension personnel spread out across 12 states of the federation. Six states were randomly selected for this study. They are: Kedah, Kelantan, Penang, Perak, Selangor and Terengganu. Using Raosoft® Sample Size Calculator indicates that a sample size of 298 is appropriate for the study. However, 328 respondents were randomly selected (10% more) to off-set non-response and unusable questionnaires. After cleaning, 272 questionnaires (83% of the distributed) were found to contain enough information to be analysed and achieve the objectives of the study. After successful collection, cleaning and coding the data was analysed using Statistical Package for Social Sciences (SPSS®) Version 21 and Microsoft Office Excel Spreadsheet. Descriptive statistics was used in the analysis.

The Mean Weighted Discrepancy Score (MWDS) of a modified Borich Needs Assessment Model (B-NAM) was used to compute training needs. First, a discrepancy score (DS) was calculated for each respondent on each competency area by subtracting proficiency rating (B) from the importance rating (A). Then, a weighted discrepancy score (WDS) computed on each individual for each of the professional competencies by multiplying the discrepancy score by the mean proficiency rating ($\bar{A}$). A MWDS for each of the competencies was then calculated by dividing the sum of the weighted discrepancy scores by

the number of observations (N) (Borich, 1980a; Mckim, 2013; Umar, Man, Nawi, Latif, & Samah, 2017; Wingenbach, 2013).

$$DS_{ij} = A_{ij} - B_{ij}$$
$$WDS_{ij} = DS_{ij} * \bar{A}_j$$
$$MWDS_j = \sum WDS_{ij} / N$$

The analysis was performed using Excel-Based MWDS Calculator (Mckim, 2013; Mckim & Saucier, 2011). The scores were further categorized to show the level of pressure of the needs. The class size (*i*) was obtained using the formula:

$$i = \frac{h-l}{k}$$

Where, *h* = highest MWDS obtained;
l = lowest MWDS obtained; and
k = number of groups (which is 3 in this study)

Results and Discussions

Perceived level of importance of climate change related competencies

Respondents were asked to evaluate the importance of 31 climate change related competencies on a scale of 1 to 5 with 1 depicting very low importance and 5 meaning very high importance. The average scores as indicated in Table 1 show that "competency in communicating climate information effectively", with a mean rating (M) of 4.73 and standard deviation (SD) of 0.75, was perceived to be the most important skill of extension worker dealing with climate change. It was closely followed by "using ICTs in climate change adaptation" (M=4.70, SD=0.53) and "promoting eco-friendly agronomic practices and farming system" (M=4.67, SD=0.61). Other high ranking competencies in order of importance include: impact of climate change on urban development (M=4.60, SD=0.72), pro-poor options for low carbon development (M=4.60, SD=0.62), promoting financial risk management/agricultural insurance (M=4.50, SD=0.72) and ability to translate scientific climate information into policy and practical guidance (M=4.47, SD=0.63). All these competencies are vital for effective advisory service delivery particularly to farmers being affected by climate change such as those covered in the study area. Generally, the high level of perceived importance attached to climate change associated competencies with a mean score of 4.35 on a scale of this is attributable to the fact that climate change is a significant phenomenon that affects agricultural production in the study area.

Table 1: Perceived level of importance of climate change related competencies among extension personnel

Competency	M	SD
Communicating climate information effectively	4.73	0.74
Using ICTs in climate change adaptation	4.70	0.53
Promoting eco-friendly agronomic practices and farming system	4.67	0.61

Competency	M	SD
Impact of climate change on urban development	4.60	0.72
Pro-poor options for low carbon development	4.60	0.62
Promoting financial risk management/ agricultural insurance	4.50	0.63
Ability to translate scientific climate information into practical guidance	4.47	0.63
Employing Disaster risk reduction (DRR) strategies	4.47	0.78
Understanding and communicating weather forecast	4.47	0.73
Extreme events monitoring and reporting	4.47	0.73
Utilizing agricultural marketing and prices information	4.47	0.73
Planning climate resilient development	4.47	0.68
Mobilizing resources for adaptation (such as funding)	4.43	0.68
Carbon emission reduction strategies in agriculture	4.43	0.73
Promoting cultivation of improved crop varieties	4.43	0.68
Developing the capacity of, and empowering vulnerable groups	4.37	0.61
Understanding basic agro-meteorological parameters	4.30	0.84
Environmental, social and economic factors for improved livelihood	4.30	0.84
Carbon sequestration strategies in agriculture	4.27	0.52
Facilitating climate change resilience via participatory approach	4.23	0.63
Impact of climate change on rural livelihoods	4.23	0.82
Mainstreaming adaptation	4.23	0.86
Biodiversity, ecosystems and resilience to climate change	4.23	0.82
Ensuring quality of information and services for onward transmission	4.20	0.61
Soil and water conservation	4.20	0.84
Capacity to build linkages among stakeholders	4.20	0.92
Promoting rearing of improved livestock breeds	4.17	0.83
Environmental protection/enhancement	4.07	0.87
Knowledge of climate change and natural resource related migration	4.00	0.32
Conducting vulnerability risk assessments for farmers and communities	4.00	0.87
Evaluating adaptation options	4.00	0.87

Perceived level of proficiency in climate change related competencies

The respondents also indicated their perceived level of proficiency (ability to efficiently perform) in the climate change competencies on a scale of 5. The competency areas with the highest proficiency scores were promoting cultivation of improved crop varieties (M=2.43, SD=0.77), planning climate resilient development (M=2.33, SD=0.80), capacity to build linkages among stakeholders (M=2.33, SD=0.76), biodiversity, ecosystems and resilience to climate change (M=2.30, SD=0.79), pro-poor options for low carbon development (M=2.27, SD=0.74). The results indicate comparatively low proficiency in climate change related competencies in extension personnel in the study area (mean proficiency =2.15). This could be attributed to the fact that most of the field-level extension workers had low level of formal education. Also, those that have gone through higher education would have graduated before the issue of climate change started getting the

attention it is enjoying now. These call for training to equip the personnel with the requisite competencies for effective extension delivery in the face of climate change.

Table 2: Perceived level of proficiency in climate change related competencies among the respondents

Competency	M	SD
Promoting cultivation of improved crop varieties	2.43	0.77
Planning climate resilient development	2.33	0.80
Capacity to build linkages among stakeholders	2.33	0.76
Biodiversity, ecosystems and resilience to climate change	2.30	0.79
Pro-poor options for low carbon development	2.27	0.74
Environmental, social and economic factors for improved livelihood	2.27	0.74
Soil and water conservation	2.27	0.74
Promoting rearing of improved livestock breeds	2.27	0.69
Carbon emission reduction strategies in agriculture	2.23	0.94
Carbon sequestration strategies in agriculture	2.20	0.76
Mainstreaming adaptation	2.20	0.81
Environmental protection/enhancement	2.20	0.85
Promoting eco-friendly agronomic practices and farming system	2.17	0.75
Impact of climate change on urban development	2.17	0.83
Developing the capacity of, and empowering vulnerable groups	2.17	0.65
Promoting financial risk management/ agricultural insurance	2.13	0.63
Extreme events monitoring and reporting	2.13	0.78
Utilizing agricultural marketing and prices information	2.13	0.51
Evaluating adaptation options	2.13	0.78
Using ICTs in climate change adaptation	2.10	0.61
Impact of climate change on rural livelihoods	2.10	0.80
Conducting vulnerability risk assessments for farmers and communities	2.07	0.69
Understanding and communicating weather forecast	2.03	0.76
Mobilizing resources for adaptation	2.03	0.81
Facilitating climate change resilience via participatory approach	2.03	0.32
Ensuring quality of climate information and services for onward transmission	2.03	0.67
Knowledge of climate change and natural resource related migration	2.03	0.32
Communicating climate information effectively	2.00	0.26
Ability to translate scientific climate information into practical guidance	1.97	0.32
Employing Disaster risk reduction (DRR) strategies	1.97	0.41
Understanding basic agro-meteorological parameters	1.97	0.81

Training needs of extension personnel related to climate change

Results in Table 3 indicate the index of "need for training" against each competency in the form of the mean weighted discrepancy score (MWDS). The findings are also ranked and grouped into levels to indicate priority needs for training (Alibaygi & Zarafshani, 2008;

Elhamoly et al., 2014; Lopokoiyit, Onyango, & Kibett, 2013). Communicating climate information effectively was ranked first with MWDS of 12.49. This reiterates the significant role of effective communication not only in classical but also in contemporary issues of agricultural extension, hence the pressing need for capacity development in the form of training. Effective communication has been identified as a core competency required of every extension worker (Suvedi & Kaplowitz, 2016). The use of information and communication technologies (ICTs) in adaptation was ranked second (MWDS = 12.22). This is also related to the first competency as ICT has the capacity to facilitate effective communication. The third competency was promotion of eco-friendly practices and systems in agriculture (MWDS = 11.67). Subsequent highly important training needs include: impact of climate change on urban development (MWDS = 11.19), ability to translate scientific climate information into policy and practical guidance (MWDS = 11.17), and employing Disaster risk reduction strategies (MWDS = 11.17). These are high pressing needs that require urgent attention of managers and policy makers to ensure competence of the workers in tackling the issue and facilitating adaptation among clients. Moderately pressing needs are the next in the line of importance and should also be considered a priority depending on availability of training resources. They include: understanding and communicating weather forecast (MWDS = 10.87), and pro-poor options for low carbon development (MWDS = 10.73). Finally, the low level pressing needs which, in these study area, require no urgent attention in terms of training. This is because of their low importance in climate change adaptation in the area and/or high proficiency among the extension workers.

Table 3: In-service training needs of extension personnel associated with climate change

Competency	MWDS	Level*	Rank
Communicating climate information effectively	12.94	1	1
Using ICTs in climate change adaptation	12.22	1	2
Promoting eco-friendly farming practices and systems	11.67	1	3
Impact of climate change on urban development	11.19	1	4
Ability to translate scientific climate information into practice	11.17	1	5
Employing Disaster risk reduction (DRR) strategies	11.17	1	6
Understanding and communicating weather forecast	10.87	2	7
Pro-poor options for low carbon development	10.73	2	8
Promoting financial risk management/ agricultural insurance	10.65	2	9
Mobilizing resources for adaptation	10.64	2	10
Extreme events monitoring and reporting	10.42	2	11
Utilizing agricultural marketing and prices information	10.42	2	12
Understanding basic agro-meteorological parameters	10.03	2	13
Carbon emission reduction strategies in agriculture	9.75	2	14
Empowering vulnerable groups	9.61	2	15
Planning climate resilient development	9.53	2	16
Facilitating resilience via participatory indigenous approach	9.31	2	17

Competency	MWDS	Level*	Rank
Ensuring quality of information for onward transmission	9.10	3	18
Impact of climate change on rural livelihoods	9.03	3	19
Promoting cultivation of improved crop varieties	8.87	3	20
Carbon sequestration strategies in agriculture	8.82	3	21
Environmental, and socio-economic factors for livelihood	8.74	3	22
Mainstreaming adaptation	8.61	3	23
Biodiversity, ecosystems and resilience to climate change	8.18	3	24
Soil and water conservation	8.12	3	25
Knowledge of climate change related migration	8.07	3	26
Promoting rearing of improved livestock breeds	7.92	3	27
Capacity to build linkages among stakeholders	7.84	3	28
Conducting risk assessments for farmers and communities	7.73	3	29
Environmental protection/enhancement	7.59	3	30
Evaluating adaptation options	7.47	3	31

**Note: Pressing levels of needs: 1 = high level; 2 = moderate level; and 3 = low level*

Conclusion

The Borich needs assessment model has proved effective in training needs assessment of employees in extension organizations. It has been successfully used in this study to evaluate the training needs of agricultural extension personnel relative to climate change adaptation advisory services. The generally high scores obtained for perceived importance of the competencies, coupled with low proficiency scores pointed to a gap in the capacity of the agricultural extension personnel in Malaysia to perform climate change related advisory services effectively. This indicates the need for in-service training of the personnel to bring them up to date and enhance their competence. This was confirmed from evaluation of the training needs using the MWDS. It is recommended that any training programme in the area should prioritize these competencies in the order in which they are ranked and grouped by this study to effectively enhance the capacity of the personnel as they tackle climate change in collaboration with the farmers.

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Effect Special skills on training need to the Agricultural Extension Agents using Borich Need Assessment Model

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The study was conducted in Iraq that significantly related to the issue. To identify the training needs of the respondents in the areas of agricultural extension. Therefore, this study is important for the following considerations; it will be led by precise training objectives, which play a significant role in avoiding some of the common mistakes. Better targeting will be helpful in improving the effectiveness and efficiency of training (Muhammad, et al. 2012). A questionnaire survey was adopted for a population of 300 professionals using certified sampling techniques. To analyze the training needs of responders "Borich's Need Assessment" model technique was used this study which focused on special skills, job satisfaction, information and scientific specialization and social demographic factors. The highest training need was found in the treatment of "name of method, with average mean =3.74, the moderate needed training was found in the treatment "use computer and ICT" (mean=3.26), and the lowest was on "management skill" (Mean = 3.15). Furthermore, the results showed that there was a significant relationship between training needs and the province, marital status, location of work, experience (r = 0.51), the number of training courses attended, special skills, job satisfaction and information.

Keywords: Training needs, special skill, Borich Needs Assessment

The agricultural self-sufficiency is a necessity for national and economic security. The agricultural sector in Iraq is greatly suffering in the past decades due to several distortions. Currently, agricultural extension or agricultural advisory services being established comprises the entire set of organizations to train the people engaged in agricultural production and facilitate their efforts to solve problems. The Ministry of agricultural in Iraq is usually involved in supporting the farmers with fertilizers, agricultural pesticides, agricultural equipment, and seeds with competitive prices. The responsible bodies of the agricultural sector in Iraq cooperated with many international organizations to keep pace with scientific developments in agriculture and to benefit from international expertise in agriculture. Development of knowledge in the agricultural sector aims to reach self-sufficiency (Saleh, et al, 2016).

Extension service has found in the developed world, helps in moving the wheel of agricultural production, enhancing the availability of food and clothing and helping get the family system, which is a townhouse unit, effective socio-economic status., In this case, the extension process has a high flexibility level to accommodate the difference in culture, economic development and philosophies of public service to be effective, (Altarawneh,

2009). The effectiveness of extension services is also highly dependent on the ability of extension workers who are responsible to transfer information from extension organizations to the clients. Previous studies have identified various competencies needed by extension workers in technical areas and human development areas. The ability of the enterprise to maximize the positive interaction between them and the competitive advantage of competencies can only be achieved with a permanent and continuous interaction between those components. The capacity, according to the approach is not an individual, but a collective one, and is not an absolute, but rather relative and variable for example, the ability to control and manage the technology available, and to adapt and interact (Sharif, 2006).

There are a lot of obstacles and problems encountered in the important interrelationship between agricultural and farm worker, and the development, transfer of knowledge, new innovations that contribute to the development of efficient agricultural leader, and ongoing training to transfer experience. Determination of the effectiveness of training based on its requirements and priority is important in order to organize the training efficiently. There is a need to improve the training courses that will help the efficiency of extension agents and trainers to undertake their work efficiently and successfully. Rapid developments in the agricultural sector necessitates high consideration to counselor's training. Also, poor skills, inadequate job working condition, business job skills, poor communication skills, and lack of courses are also administrative difficulties confronting the agricultural sector (Ovwigho, 2011).

Objectives of Study

The objective of the study was to examine the training needs of agricultural extension employees by identifying the training needs required and examining the relationship between these training needs and several social demographic factors of the employees and job satisfaction, information and special skills.

Materials and Methods

The study's design is a descriptive study. It focused on the population of all AEAs in Baghdad, Babylon, and Wasit Provinces in the Middle Iraq consisting of 300 agents. The list of AEAs was obtained from the Agricultural Organization of Baghdad, Babylon, and Wasit Provinces. Census populations were used and as such, the findings from this study can only be generalized to the population. The data collection was undertaken in two phases. The first stage was a Delphi technique involving 18 areas in agriculture experts in Faculty of Agriculture and Agricultural Organizations in middle Iraq. Based on the summary of responses from the first round questionnaire, 16 items in agriculture were summarized for the second-round questionnaire. The data were analyzed statistically using the computer software statistical package for ANOVA One-way, Excel and SPSS data collected from the survey was put in verification process in order to verify them. The process of data cleaning was also done in order to have a good arrangement of data without errors. In this case, the statement in alternative hypothesis says that at least one of the category gave the different effect.

However, it doesn't positively show which category that gives the different effect. To analyze the training needs of responders "Borich Need Assessment Model" technique was used for training needs. Borich (Randol, 1988) defined a training need as "a discrepancy between an educational goal and trainee performance in relation to this goal.

Results and Discussion

Training needs

Table 1 shows that the majority of the respondents were needed moderate training in agriculture, the highest training needed was on the skill and knowledge of teaching method with mean values (3.74). The moderately needed training was on the Skills in Computers and ICT with mean values (3.26). While the lowest average mean in the skill and knowledge in Management with mean values (3.15). Five score for measuringt training needs (Never Needed, No need, Neutral, Strongly Needed, Very Strongly Needed), ranging from 1 to 5 required of every answer sequentially. Entries in Table1 indicate that the respondents needed training in the following areas: Skills in Plant Technology (X=3.30), Skills in Irrigation and Drainage (X=3.21), Skill in Fertilization (X=3.23), Skill in Animal husbandry (X=3.31), Skill in machines and equipment (3.22), Skills in Plant Protection (X=3.19), Skill in Horticultural Crops (3.21), Skills in Entomology and Diseases (3.22), Skill in Integrated Pest Management (3.33), Skills in Extension Philosophy (3.22), Skills in Program Planning, Implementation and Evaluation (3.27), Customer Skills (3.58), Business Skills (3.64). However, all kinds of training needs were found to be above the value of 3, meaning that all of them were strongly needed. Therefore, need to focus when planning training and discuss with the employees to know what the subject's, courses are important before training.

According to (Bekele and Pillai, 2011), about 50 to 75% of training was perceived to be more practical as a vital part of the training program. Aldgni (2007), found that the respondents have a medium need for training. The field of fish diseases and their causes were most in need of training, There was a positive relation between the level of training needs and ponds area, and negative relationship with years of experience, training courses and net profit. The results of study (Vishal Raina, et al,. 2014), revealed that a majority of farmers needed a medium to high level of training in areas like seed treatment, optimum dose of fertilizer, identification of insects/disease & their control measures, identification of weeds storage, proper use of rainwater and marketing of storage. Study by (Man, et al, 2016) indicated that training was needed in all areas studied, as shown by the average mean of above 3 meaning that all of them strongly needed training. The most training needed for agric officer with respect to mechanized farming in Punjab to operate modern machines, equipment and implements (khan et al., 2011). According to (H. Vasudevan, 2014) the correlation coefficients indicate the hard point of the connector between the variables, where a coefficient is considered significant if the p–value is less than 0.05. Overall, the results from this work revealed that training commitment, training needs assessment, training contents, and delivery approaches, and training evaluation positively and significantly influence the employee's work commitment, job satisfaction, and job performance. Study by Saleh, et al (2015) indicated a high level of training needs in multiple areas in agriculture.

Table 1: Distribution of Respondents According to Level of Training needs in Agriculture

No.	Knowledge and Skills	Mean	S. D	Grade
1.	Skills in Plant Technical	3.30	.63	6
2.	Skill in Irrigation and Drainage	3.21	.69	14
3.	Skill in Fertilization	3.24	.71	11
4.	Skill in Management	3.15	.67	16
5.	Skill in Animal husbandry	3.32	.69	5
6.	Skill in machines and equipment	3.22	.74	12
7.	Skills in Plant Protection	3.18	.73	15
8.	Skill in Horticultural Crops	3.22	.68	13
9.	Skills in Insects and Diseases	3.22	.65	10
10.	Skill in Integrated Pest Management	3.33	.67	4
11.	Skills in Extension Philosophy	3.25	.69	9
12.	Skills in Computers and ICT	3.26	.67	8
13.	Skills in Program Planning, Implementation and Evaluation	3.27	.70	7
14.	Name of Methods	3.74	.63	1
15.	Customer Skills	3.57	.61	3
16.	Business Skills	3.64	.66	2
	Total Average Mean		3.32	

Note: 1=Never needed, 2=No need, 3=Neutral, 4=Strongly needed, 5=Very strongly needed

Special Skills

Results in Table 2 indicate that the highest proportion of training needed were special skills, the work skills, which shows the highest relationship between this skills and training needs which is at 0.585. Correlation with special skills is a significant relationship at level 0.01. From this equation, it was shown that special skill (leadership skills) influenced more on training needs, need to attention for these skills to give employees more efficient and activities in your job. The middle significant in these skills is communication skills and work skills, with correlation 0.462, 0.516, also significant at level 0.01. The lowest training need in these skills on "with others", with correlation 0.375 at level 0.01. All four items have an intermediate positive relationship with training need. There is a significant relationship between these four items (variable special skills) and training needs, which reject the earlier hypothesis. They agreed that extension agents needed training in four out of training needs specified in their job descriptions. All four items in this skill have an intermediate positive relationship with training need. There is a significant relationship between this variable and training need. So "Reject the hypothesis: There is a significant correlation between respondents need for training and special skills in the study".

That meaning this special skills impact on model of Borich Needs Assessment need to pay attention to this skill to get high efficiency of the employees. Because of that some employees have skills in agriculture and do not have this special skill. Therefore their inability to do their jobs efficiently and thus a lack of performance.

Furthermore, Borich's Need Assessment Model proved to be effective in that agricultural extension officers are given the opportunity to judge their performance objectively. In the past, training needs of agricultural extension officers, were assessed subjectively by administrators with limited participation of extension agents. This model, however, should be used across agricultural organizations in Iraq in order to improve its psychometric properties.

Table 2: Relationship between Special Skill and Training Needs

No.	Special Skills	Mean	S.D
	Work Skills		
1.	Establishing and monitoring organization goals and objectives	3.68	1.02
2.	Responding to changes in organization	3.62	.92
3.	Encouraging teamwork among employees and departments to achieve organizational' goals	3.86	.93
4.	Setting up and monitoring timeframes and plans	3.77	.89
5.	You can take advantage of continuous learning and self-development opportunities	3.75	1.00
6.	I am loyal to the organization and dedicated to interact and communicate with others employees	3.65	.90
7.	Understand and pursuit of the organization's mission and valuable	3.61	1.02
8.	Taking necessary measures to overcome unexpected obstacles encountered during the execution of plan or project	3.72	1.04
	Correlation-r	0.516**	
	Communication Skills	Mean	S.D
1.	Understanding clear and assertive communication skills and how they create report and trust	3.67	.99
2.	Conducting effective and efficient meetings	3.76	.93
3.	Fostering an environment for open communications	3.70	.96
4.	Make clear and convincing oral presentations	3.68	.92
5.	Develop good listening skills	3.75	.96
6.	Write effectively for target audience	3.73	1.01
7.	Use latest communications technology	3.82	1.04
8.	Develop a marketing plan for programs for agricultural extension	3.86	1.05
	Correlation-r	0.462**	
	With others	Mean	S.D
1.	Conducting a regular meetings to discuss the execution and achievement of objectives	3.64	1.09
2.	Encouraging collaboration and teamwork as a method to accomplish tasks and achieve goals	3.73	1.00
3.	Recognizing and rewarding employee for doing their best	3.76	1.00
4.	Constructively receiving criticism and suggestions from others	3.65	1.02
	Correlation-r	0.375**	
	Leadership	Mean	S.D

1.	Understand leadership principles	3.68	.99
2.	Understand workgroup dynamics	3.66	1.02
3.	Develop a plan for building personal leadership skills	3.71	.98
4.	Understand the relationship of personal goals to job performance	3.68	.99
5.	The ability of using the recent result and development to persuade other party to change the behavior	3.65	1.05
6.	Apply critical thinking skills	3.64	1.00
	Correlation-r	0.485**	
	Correlation –r	0.521**	

Note: 1=non applicable, 2=not important, 3=somewhat important, 4=important, 5=very important
Correlation is significant at the 0.01 level (2-tailed).** (P<0.01).

Conclusion and Recommendation

First of all, the surrounding environment of the officers need to be assessed because it will determine the different training needs. Different training may be appropriate due to variation in crops, technical, skills, knowledge, information, special skills, social demography, and training courses. Also, had another traditional in this village than the need to know from the offices before planning the training. Furthermore, some villages need different technology from another area, because of difference in climate, crop, and suitablity of type of plant breeding and animal husbandry. In order to have a training program that meets all aspirations to promote the agricultural sector, there must be a training program with the training needs identified to avoid loss of time, effort, and resources spent without achieving specific training objectives to enhance agricultural productivity. It is recommended that other stakeholders be mindful contacted to assess their view of the findings. Through the study explained that experience a significant impact in extension work and has increased staff expertise to further diversify and orderly and thoughtful as training needs required for the development of agriculture information, knowledge, and skills in the country.

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Improving the Growth of *Centella asiatica* Using Surfactant Modified Natural Zeolite Loaded with NPK Nutrients

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There are great interest in using sustainable fertilizer to enhance the crops quality especially Centella asiatica, which is known for its various medicinal properties. Here, we examined the performance of NPK-Organo-Zeolite (NPKOZ) as a controlled release fertilizer for the growth of C. asiatica (pennywort). Modification of the natural zeolite with the surfactant hexadecyltrimethyl ammonium (HDTMA) was performed and characterized with X-ray diffraction and Fourier transform infrared spectroscopy techniques. The addition of major nutrients; ammonium (N), phosphate (P) and potassium (K) in the zeolite was successful based on the ion exchange capability of the zeolite. For the plant growth study, a comparison was made with eight different treatments including chemical fertilizers of monoammonium phosphate and monopotassium phosphate for 70 days. Morphological (number of flowers, branches and leaves, specific leaf area, plant biomass) and biochemical growth parameters (N, P, K and chlorophyll contents) of the plant were studied. The NPKOZs treatments resulted in the highest number of leaves, branches and flowers ($12.67^c \pm 1.45$, $5.33^b \pm 0.88$, $3.33^a \pm 1.76$, Duncan test, $\alpha = 0.05$) among all treatments. In addition, the total chlorophyll content and chlorophyll a and b contents also were the highest with NPKOZs application. The NPK contents in the C. asiatica plants were comparable with the chemical fertilizers tested. Besides, the trend of the NPKOZs optimization for plant growth parameters was observed directly proportional with the quantity applied. Thus, it can be concluded that NPKOZ fertilizer is a suitable controlled release fertilizer for the improvement of the growth of C. asiatica.

Keywords: Centella asiatica, Zeolite, Surfactant modified zeolite, NPK fertilizer

Plant herbs especially the leafy or parts of soft flowering provide valuable fibre and medicinal properties (Chomchalow, 2002). One of many potential vegetable that needs to be improved is *Centella* species locally known as "pegaga". *Centella asiatica* belongs to the family of Apiaceae and mostly found in tropical and subtropical countries such as India, Southeast Asia and South Africa (Gohil *et al*., 2010). In Malaysia, pennywort represents one of the herbs that can treat numerous medicinal and pharmacological problems (Zahara *et al*., 2014). Different types of photochemical compounds such as triterpene acid, flavonoids and alkaloids are useful in medicinal problems (Das, 2011). Besides that, various clinical and therapeutic benefits mainly antioxidant activity and antifungal activity of *C. asiatica* have been studied (Zahara *et al*., 2014).

The inappropriate techniques for growing the desired plants might cause environmental disturbance such as eutrophication and groundwater contamination due to the nutrients leaching (Babiker *et al.*, 2004; Penuelas *et al.*, 2009). The typical fertilizer used in agricultural practices caused side effects that should be highlighted. For example in China, Xu *et al.* (2010) stated that the nitrogen leaching that caused groundwater contamination is a national major concern resulting from agricultural activities. Besides, the effects of algal bloom caused by the excess of P in fertilizer continuously remain the same over the past 40 years in Catalonia, Spain (Penuelas *et al.*, 2009). In Malaysia perspective, a study have been reported by Ah Tung *et al.* (2009) regarding the N and K fertilizers implementation in oil palm showed a concern in leaching problems especially for groundwater quality. There are various methods in combating nutrients leaching and one of them is by using a slow release fertilizer (SRF). The emergence of SRF in the market is for reducing nutrients losses, increased crop yields and lowering the fertilization expenditure (Sempeho, 2014). The addressed problems suggested that one suitable SRF's transport system is needed in supplying adequate nutrients to the plants.

Other than that, zeolite which is a 3-dimensional aluminosilicates significantly used in agriculture mainly clinoptilolite-type zeolite, could improve fertilizer efficiency, gas absorption and water absorption (Polat *et al*., 2004). Zeolite itself is inadequate to grow the plants because of lack in major nutrients. Major macronutrients like N is needed to improve the leaf fruits production, P as an important phosphate source for nucleic acid and K is a vital role in photosynthesis activity (Marschner, 2011; Schachtman *et al*., 1998; Prajapati and Modi, 2012). The zeolite efficiency can be improved by modifying the zeolite's external surface using a cationic surfactant (Rehákova *et al*., 2004). It can hold the P element and combination of zeolite itself could hold N and K nutrients. One of the major characteristics of this fertilizer is the ability to slowly release the nutrients. Nevertheless, the related reports only mentioned the N-loaded and P-loaded surfactant modified zeolite (SMZ) as a fertilizer (Li, 2003; Bansiwal *et al*., 2006). The introduction of N, P and K onto zeolite is a better way of increasing nutrients retention capacity in crops production. Based on this, the growth of *C. asiatica* can be optimized by using the NPK-Organo-Zeolite (NPKOZ). The aims of this study was to characterize, compare and optimize the effectiveness of NPKOZ and conventional fertilizers for the growth of *C. asiatica*. Thus, it is hoped to bring a valuable solution to increase the desired yield of pegaga and reducing environmental concern for leaching problems by applying SRF model (Sempeho, 2014).

Materials and Methods

Preparation and Characterization of NPK-Organo-Zeolite

Clinoptilolite from Indonesia was obtained from Provet Group of Companies Sdn Bhd from Serdang, Selangor. Monoammonium phosphate (MAP) and monopotassium phosphate (MKP) fertilizers were retrieved from Greentrade Sdn Bhd, Segamat while Ferti 45 (F45) fertilizer was obtained from Fertiland Trading Co., Kepong. The surfactant hexadecyltrimethyl ammonium bromide (HDTMA-Br) and potassium chloride (KCl) were supplied by Qrec (Asia) Sdn Bhd. The preparation process of NPK-Organo-Zeolite was

referred to Malek *et al*. (2014) which began with the addition of 40 g clinoptilolite (cli) with KCl and stirred overnight by using a magnetic stirrer. Then, the mixture was filtered with 185 mm Macherey-Nagel filter paper and dried in an oven at 80°C overnight. Next, the solid mesh was ground with mortar and pestle into powder form and sieve. The steps were repeated three times to ensure most K ions are located inside the zeolite framework to form K-cli. Next, 10 g of K-cli were mixed with 4 mM of HDTMA and Organo-K-cli (OKC) was obtained after the grinding process. Lastly, 40 g of Organo-K-cli was added into MAP to form the final product which is NPKOZ. Each product formed was characterized by X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) with ATR (Attenuated Total Reflectance) sampling technique (Malek, 2011; Malek *et al.*, 2014).

Collection of Data, Propagation and Cultivation Process of Centella asiatica

The soil pH were maintained at pH 7 and sandy loamy soil was used throughout the experiment (Devkota and Jha, 2009). *C. asiatica* was obtained from Veterinary Institute, Kluang and the propagation was done through vegetative state due to its ease and main cultivation process (Peiris and Kays, 1996). The *C. asiatica* was cultivated and grouped for eight different treatments (control (C), clinoptilolite (Cli), MAP, MKP, F45, NPKOZ5, NPKOZ10 and NPKOZ15) in a semi-greenhouse at an Agriculture Unit, Faculty of Education, UTM for 35 days. The experiment was done in triplicates. At least 3 leaves per plantlet were planted into 60% sand: 40% soil that was evenly mixed (Devkota and Jha, 2009). The harvest period was done after 70 days of cultivation (Zainal, 2005). Morphological growth parameters like number of leaves, branches, flowers, biggest leaf area (BLA) (cm^2) and biggest specific leaf area (BSLA) (cm^2/g) were measured (Pérez-Harguindeguy *et al.* 2013). Meanwhile, the total fresh biomass (TFB) and total dried biomass (TDB) of *C. asiatica* were weighed and then dried in an oven at 60°C for 48 hours (Devkota and Jha, 2009). Determination of the biochemical growth parameters was conducted after harvesting the plants including the chlorophyll detection in leaf using acetone were performed and fresh leaves extract was determined with the absorbance value of 662, 646, and 470 nm. (Pompelli *et al*., 2013). Lastly, the samples have been analysed at Ayer Hitam Agriculture Institute (IPAH), Ayer Hitam, Johor for the analysis of N, P and K in *C. asiatica*.

Statistical Analysis

The data from each parameter were analysed by computing software, Statistical Package for the Social Sciences (SPSS) software version 16. A one-way analysis of variance (ANOVA) test involving one species (*C. asiatica*), morphological growth parameters and eight treatments was interpreted. The post hoc Duncan Multiple Range Test (DMRT) was conducted to compare the means and find the existence of variation. Lastly, Pearson Correlation test was carried out to identify the correlation between the parameters with the significance level of ($p < 0.05$).

Results and Discussion

Characterization of NPK-Organo-Zeolite

The amount of HDTMA-Br adsorbed on K-cli was 159.67 ± 6.10 mmol/kg which can be considered high because the amount loaded was more than 80% (84.07 ± 0.65%). The main mechanism involved in the formation of the SMZ is based on the high ionic exchange properties of the clinoptilolite (Gangele *et al.*, 2014). XRD analysis of raw clinoptilolite was compared with modified zeolite (K-cli, OKC and NPKOZ) in **Figure 3.1(i)**. Most of the material detected consists of clinoptilolite (C) and some quartz and mordenite as impurities (Treacy and Higgins, 2007). FTIR was done to detect the presence of HDTMA molecules in the sample (**Figure 3.1(ii))**. The most notifiable peaks were observed (in circle) in the FTIR spectra where the HDTMA-Br surfactant was confirmed attached on the surface of clinoptilolite in the Organo-K-cli (2921 and 2850 cm^{-1}) and NPKOZ (2923 and 2851cm^{-1}). Both bands were in line with the finding from previous study (Bardakçi and Bahçeli, 2010; Malek, 2011) where these bands proved the presence of CH_3 asymmetric and CH_2 stretching of the HDTMA molecules, respectively. The FTIR peaks below 1000 cm^{-1} represent Si-O-Al and Si-O-Si bonding properties with a weak peak at 793 cm^{-1} for the symmetric bonding. In addition, the strong intensity for the wide peak at 1008 cm^{-1} is referred to asymmetric bonding (Sharuddin *et al*. 2014) which similarly observed at bands around 1000 cm^{-1} and 500 cm^{-1}. The presence of clinoptilolite can also be seen in many specific bands from 3400 cm^{-1} and 3700 cm^{-1} bands (Mansouri *et al.*, 2013).

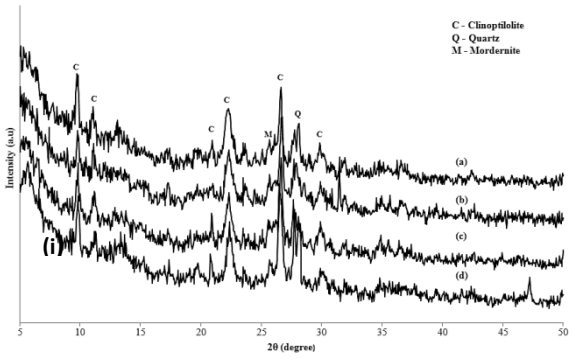

Figure 3.1 Comparison of (i) X-ray diffractograms (ii) FTIR spectra; (a) Cli, (b) K-cli, (c) OKC and (d) NPKOZ

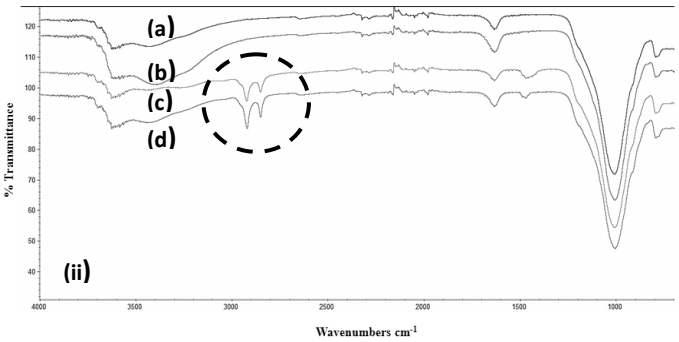

Figure3.2 *Comparison between NPKOZ and Conventional Fertilizers towards the C. asiatica Growth.*

The morphological growth parameters in **Table 2** showed the number of leaves counted for eight different treatments towards *C. asiatica* growth. NPKOZ15 have the highest number of leaves after 70 days of cultivation. In contrast, MAP with a lot of ammonium element for leaves development did not produce high number of leaves. Moreover, the number of branches by the NPKOZ10 and NPKOZ10 were higher than other treatments. Furthermore, the numbers of flowers were more for the NPKOZ10 and NPKOZ15 treatments. Besides, the TFB accumulated was compared with TDB for the whole plant during harvesting time. Interestingly, even though Ferti 45 had the highest TFB, the biggest reduction of its weight after heating treatment into the TDB was noticeable. On the other hand, the NPKOZs treatments increased steadily for its TFB and TDB with increased in its quantity give better results than other systems except for the Ferti 45 system. Based on the result of leaves number, six out of eight treatments mean score were considered rejecting the

null hypothesis except for control (M = 2.33, SD = 0.58) and NPKOZ15 (M = 12.67, SD = 2.52) that did not differ significantly from other treatments.

In term of the biggest leaf area (cm^2) (BLA) and biggest specific leaf area (cm^2/g) (BSLA) selected during harvesting time, Ferti 45 application towards pegaga contributed the highest value compared to other seven systems. However, NPKOZ5 application resulted as good as MAP and MKP fertilizers performance. In overall, the increased in the amount of NPKOZ used (5, 10, 15 g) increased the morphological growth parameters. There are two major biochemical growth parameters presented in this study; the chlorophyll contents and N, P, and K contents for the growth of *C. asiatica* (**Figure 3.3**). In this study, the application of NPKOZ5, NPKOZ10 and NPKOZ15 dominated the total chlorophyll content (TCC) while Ferti 45 resulted in the lowest TCC value compared to the entire systems applied. **Figure 3.3** showed the N, P and K contents in *C. asiatica* for different treatments after harvested. MAP and MKP as chemical fertilizers justified their composition well for instance MAP having the highest value of N content and also MKP, with slightly higher P element. In terms of N and K contents, Ferti 45 showed the highest percentage while NPKOZs treatments were comparable with MAP and MKP, but much better than control and cli.

Table 2: Means comparisons with morphological growth parameters in eight different treatments towards the growth of *C. asiatica* after 35 days. For each parameter, significant difference between means among different treatments are indicated by different letters (Duncan test, α= 0.05).

Treatments	No. of leaves	No. of branches	No. of flowers	TFB (g)	TDB (g)	BLA (cm^2)	BSLA (cm^2/
Control	$2.33^{a} \pm 0.33$	$1.00^{a} \pm 0.00$	$0.00^{a} \pm 0.00$	$1.28^{a} \pm 0.45$	$0.10^{a} \pm 0.03$	$7.33^{a} \pm 0.33$	$383.33^{a} \pm 16.$
Cli	$4.33^{ab} \pm 0.88$	$1.33^{ab} \pm 0.33$	$0.33^{a} \pm 0.33$	$4.64^{ab} \pm 0.24$	$0.47^{ab} \pm 0.05$	$12.33a^{b} \pm 1.09$	$316.11^{a} \pm 33.$
MAP	$6.00^{abc} \pm 1.53$	$2.33^{ab} \pm 0.67$	$0.67^{a} \pm 0.33$	$4.58^{ab} \pm 1.88$	$0.51^{ab} \pm 0.20$	$14.67a^{bc} \pm 3.72$	$330.24^{a} \pm 25.$
MKP	$5.00^{abc} \pm 1.00$	$2.33^{ab} \pm 1.33$	$1.33^{a} \pm 1.33$	$5.35^{ab} \pm 0.60$	$0.37^{ab} \pm 0.08$	$13.83^{abc} \pm 0.73$	$422.22^{a} \pm 43.$
F45	$11.00^{bc} \pm 4.04$	$4.33^{ab} \pm 1.76$	$1.67^{a} \pm 1.67$	$8.91^{b} \pm 2.80$	$0.77^{b} \pm 0.28$	$21.33^{c} \pm 3.81$	$452.50^{a} \pm 58.$
NPKOZ5	$5.33^{abc} \pm 1.45$	$2.00^{ab} \pm 1.00$	$1.33^{a} \pm 0.88$	$7.67^{ab} \pm 0.46$	$0.39^{ab} \pm 0.46$	$15.67^{abc} \pm 2.09$	$428.33^{a} \pm 73.$
NPKOZ10	$12.00^{bc} \pm 4.36$	$5.00^{ab} \pm 2.31$	$3.33^{a} \pm 1.76$	$6.40^{ab} \pm 2.30$	$0.69^{ab} \pm 0.24$	$14.67^{abc} \pm 1.96$	$346.67^{a} \pm 39.$
NPKOZ15	$12.67^{c} \pm 1.45$	$5.33^{b} \pm 0.88$	$3.00^{a} \pm 1.53$	$8.13^{b} \pm 2.12$	$0.91^{b} \pm 0.30$	$19.33^{bc} \pm 4.10$	$348.33^{a} \pm 53.$

Notes: (Included Standard Error Mean (SEM), Total Fresh Biomass (TFB), Total Dry Biomass (TDB), Biggest Leaf Area (BLA), and Biggest Specific Leaf Area (BSLA))

Table 3: Pearson correlation coefficients comparisons with morphological growth parameters in eight different systems towards *C. asiatica* growth at significance level Sig (2-tailed). Noted that * represent significant ($p<0.05$) and ** represent highly significant correlation ($p<0.01$).

Parameters	No. of	No. of	No. of	TFB	TDB	BLA	BSLA

	leaves	branches	flowers	(g)	(g)	(cm^2)	(cm^2/g)
No. of leaves	1						
No. of branches	.948**	1					
No. of flowers	.817**	.874**	1				
TFB	.908**	.814**	.759**	1			
TDB	.866**	.768**	.785**	.969**	1		
BLA	.522**	.398	.443*	.688**	.663**	1	
BSLA	-.095	-.105	-.108	.018	-.105	.070	1

Notes: (Total Fresh Biomass (TFB), Total Dry Biomass (TDB), Biggest Leaf Area (BLA), Biggest Specific Leaf Area (BSLA))

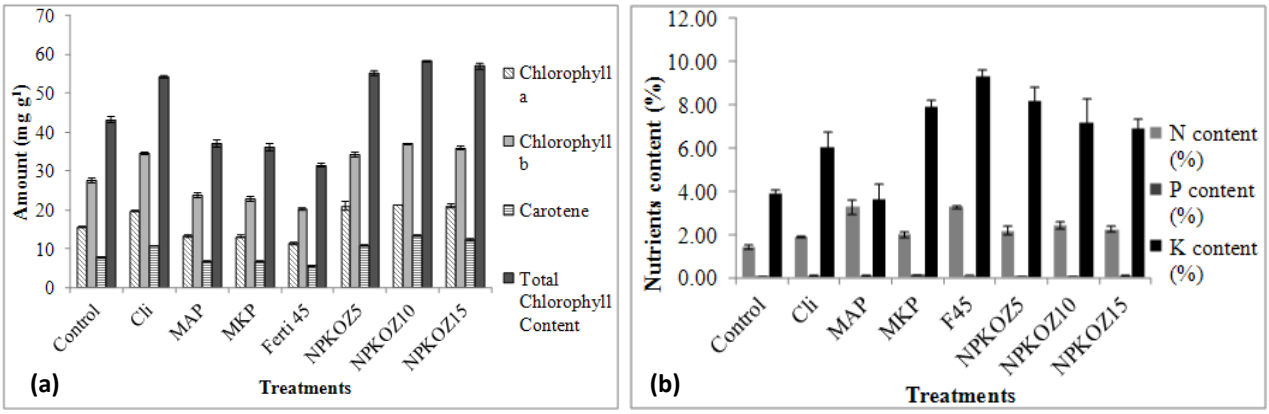

Figure 3.3 (a) Chlorophyll contents (b) NPK contents *C. asiatica* after eight days of treatments

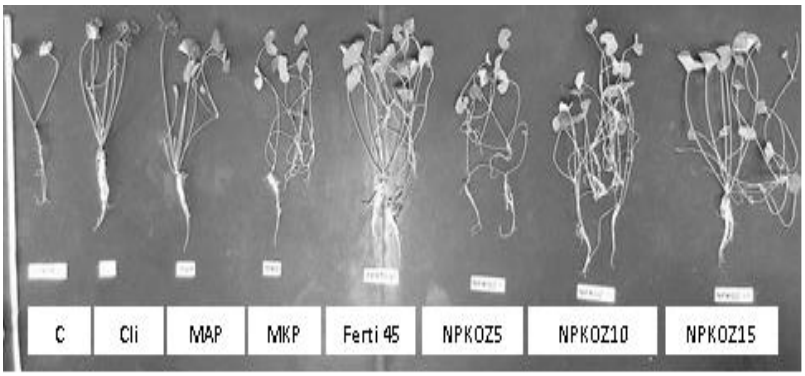

Figure 3.4 A visual comparisons among eight different treatments in the growth of *C. asiatica* after 70 days of cultivation

Discussion

The surface of clinoptilolite which is covered by the negative charge made it possible to attract other cations especially the surfactant HDTMA-Br that have the polar head surrounded with positive charge creating SMZ and eventually, the SMZ has the ability in adsorbing anionic compounds such as phosphate (Haggerty and Bowman, 1994). From the XRD, the

crystalline structure of the modified zeolite remain unchanged and stable after undergoing several reaction process which are heating and nutrients loaded process (Malek *et al*. 2015). Thus, the stable ionic nature of the zeolite framework helped attract the cation charge for instance, ammonium and potassium cations as well as amphiphilic compounds of HDTMA-Br surfactant in attaching phosphate ions towards the formation of NPKOZ. Thus, the NPKOZ production was achieved and very stable even though the cli was introduced with heat and physical treatments throughout the process. It is possible that the clinoptilolite will remain intact as a medium in the soil. On the other hand, the morphological study for the number of branches, leaves and flowers along with the changes of TFB to TDB showed that the NPKOZs application was better than other treatments which are known for its SRF properties. There was a strong, positive correlation between number of branches ($r = .948$, $n = 24$, $P<0.01$), number of flowers ($r = .817$, $n = 24$, $P<0.01$), TFB ($r = .908$, $n = 24$, $P<0.01$), TDB ($r = .866$, $n = 24$, $P<0.01$), and BLA ($r = .522$, $n = 24$, $P<0.01$) towards the number of leaves in **Table 3**. A similar results pattern can be seen in parameter number of branches and chlorophylls. Rehakova *et al.* (2004) suggested that the cli loaded with certain nutrients might thrive longer during vegetation, as the nutrients were released slowly. Additionally, it is not only for the first year of propagation, but also for the second and the subsequent years. This finding might be contributed in the making of NPKOZ that was added with the MAP at the last stage of the preparation. By supplementing MAP onto the surfactant layer, NPKOZ was able to discharge the ammonium element that helped in leaf formation and phosphate element for the cell nucleic development for the growth of the plants stem (Marschner, 2011; Schachtman *et al.*, 1998). Besides that, the last nutrient to be released is K element inside NPKOZ that is regularly known to induce the growth of flowers (Hitchmough, 2008). The presence of flower as an essential organ for the plants reproduction could have been related with the previous numbers of branches formed, where the flower arose from beneath. In term of biochemical parameters, chlorophyll is one of the vital photosynthesis constituent that occurred in plant tissue (Goswami and Ahire, 2016). Chlorophyll also served as parts of important compounds in antioxidant property, namely the carotenoid (Tatmiya *et al*., 2014). This outcome (**Figure 3.3)** showed a valuable property of NPKOZ as a single solution to increase the chlorophylls content in the leafy plant. Although the uptakes of NPK is fewer by the whole plant for NPKOZs application compared to Ferti 45, the initial conclusion was that the NPKOZs is slightly better than its counterpart. The ability of NPKOZ to release the nutrients as discussed in the characterization section might provide a sufficient source of nutrients even with less amount. Lastly, **Figure 3.4** showed the differences in the overall treatments for the growth of *C. asiatica* which could shed a light of the importance of NPKOZ in improving this herb.

Conclusions

Different stages of samples were determined by XRD and FTIR technique justified the presence of surfactant attached on the surface of cli. NPKOZs treatments were able to attain the highest number of leaves, flowers and branches as well as overall chlorophyll contents.

Lastly, the NPKOZs optimization is directly proportional to its quantity applied and it is a potential suitable fertilizer for the growth of *C. asiatica*.

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Effectiveness Of Baggassorb Absorption

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Sugar cane bagasse is a waste product from sugar cane extraction. It can be used in the manufacture of paper pulp and as fuel. Bagasse represents 30-32 % of the sugar cane plant. Sugar cane bagasse is not being used at present, and generally is burnt. So the bagasse just becomes waste material. Based on this problem sugarcane can be turned into useful product. This research is to find out whether there is any possibility of using bagasse in absorbing oily liquid. We compared the characteristics of existing absorbing element in the market that is coco peat (coconut husk) with sugarcane bagasse. We make an experiment to observe the ability of absorbing between 2 samples bagasse and coco peat. Both samples were tested in powder because the existing absorbing product was designed in powder form. We measured the ability to absorb by weighting the mass of the samples after 5 – 10 minutes the samples were mixed with oil. The experiment is repeated with the different quantity of oil. The results of this research show that sugarcane bagasse has an ability to absorb oil even though it is less effective than coco peat. For improvement, we will try to combine the sugarcane bagasse and the coco peat for the next research. Maybe this combination will produce a better absorption rate.

Keywords: sugarcane bagasse, characteristics, absorbing, baggassorb

Bagasse contains lignocellulosic material. Lignocellulose is a generic term for describing the main constituents in most plants, namely cellulose, hemicelluloses, and lignin. Lignocellulose is a complex matrix, comprising many different polysaccharides, phenolic polymers and proteins. Lignocellulosic biomass consists of a variety of materials with distinctive physical and chemical characteristics. It is the non-starch based fibrous part of plant material.(Salman, 2015). The fibre, can absorb up to 18 times their weight of oil and if the fibre being biodegradable it will have no adverse environmental impact. (Pfaffli, 1995). Bagassorb is an oily liquid absorbing product that is made of sugar cane bagasse. The characteristics of Bagassorb can be described based on the characteristic of sugarcane bagasse. It is lignocellulosic, natural and organic material, safe non-toxic and biodegradable. The sugarcane bagasse is milled into particles to minimize the surface area so that the absorption rate is high.

Problem Statement

Currently, sugar cane bagasse is not being used and is generally burnt. This can cause air pollution. It is better to turn it into a useful product than to discard it as a waste.

Significance of Study

The research is trying to produce Bagassorb as liquid absorbent made of sugar cane bagasse. Its potential benefit is expected to be able to absorb spilled liquid. The lignocellulose contain in sugarcane bagasse is hydrophilic and if applied to liquid it can react as absorbent.

The research will give better understanding about the utilization of waste material such as sugar cane bagasse.

After the completion of this research, it will have the potential benefit to those who need to use this product and may be used as a source of reference or purpose to gain more knowledge about sugar cane bagasse.

Objective

The main objective of this study is to utilize sugar cane bagasse in the preparation of absorbing liquid product; Bagassorb.

Scope

This study is uses sugarcane bagasse as the main raw material for Bagassorb making. Other than that, this study only focuses on how effective the Bagassorb can absorb the oily liquid spills.

Literature Review

Sugar Cane

Sugarcane is one of the most promising agricultural sources of biomass energy in the world. Sugarcane produces mainly two types of biomass, Cane Trash and Bagasse. Cane Trash is the field residue remaining after harvesting the Cane stalk while bagasse is the fibrous residue left over after milling of the Cane, with 45-50% moisture content and consisting of a mixture of hard fibre, with soft and smooth parenchymatous (pith) tissue of high hygroscopic property.(Salman, 2015)

Bagasse

Bagasse is the fibrous matter that remains after sugarcane stalks are crushed to extract their juice. The dry pulpy residue is left after the extraction of juice from sugar cane. Sugar cane bagasse (SCB) is a secondary by-product of sugar cane extraction factories. It is used in the manufacture of pressed fibrous woods, paper pulp and as fuel. Bagasse represents 30-32 % of the sugar cane plant (Barnes, 1980).

Lignocellulosic material

Lignocellulosic materials are a natural, abundant and renewable resource. It contains composition of lignocellulosic material. Lignocellulosic materials including agricultural waste (bagasse), forestry residues, grasses and woody materials have great potential for bio-

fuel production. Typically, most of the agricultural lignocellulosic biomass is comprised of about 10–25% lignin, 20–30% hemicellulose, and 40–50% cellulose.
Change (1987) mentioned that, lignocellulosic materials are complex insoluble molecules made up of aromatic building blocks resistant to break down. This complex molecules consists of three main components; cellulose, hemicellulose and lignin with varying proportions.

Absorbent material

Water absorbing materials are cellulosic or fibre-based products. Choices are tissue paper, cotton, sponge, and fluff pulp. The water absorbent capacity of these types of materials is only up to 11 times their weight, but most of it is lost under moderate pressure. (Kabiri, 2003)

Oily liquid

An oil is any neutral, nonpolar chemical substance that is a viscous liquid at ambient temperatures and is both hydrophobic (immiscible with water, literally "water fearing") and lipophilic (miscible with other oils, literally "fat loving"). Oils have a high carbon and hydrogen content and are usually flammable and slippery.
The general definition of oil includes classes of chemical compounds that may be otherwise unrelated in structure, properties, and uses. Oils may be animal, vegetable, or petrochemical in origin, and may be volatile or non-volatile. They are used for food, fuel, lubrication, and the manufacture of paints, plastics, and other materials. Specially prepared oils are used in some religious ceremonies as purifying agents. (Kvenvolden, Keith A, 2006)

Cellulose

Cellulose is an organic compound with the formula $(C_6H_{10}O_5)_n$, a polysaccharide consisting of a linear chain of several hundred to many thousands of β(1→4) linked D glucose units. Cellulose is an important structural component of the primary cell wall of green plants, many forms of algae and the oomycetes. Some species of bacteria secrete it to form biofilms. Cellulose is the most abundant organic polymer on Earth. The cellulose content of cotton fibre is 90%, that of wood is 40–50% and that of dried hemp is approximately 57%. (Britannica, 2008)
Cellulose has no taste, is odourless, is hydrophilic with the contact angle of 20–30, is insoluble in water and most organic solvents, is chiral and is biodegradable. It was shown to melt at 467 °C in 2016. It can be broken down chemically into its glucose units by treating it with concentrated acids at high temperature.

Hemicellulose

A hemicellulose (also known as polyose) is any of several heteropolymers (matrix polysaccharides), such as arabinoxylans, present along with cellulose in almost all plant cell walls. While cellulose is crystalline, strong, and resistant to hydrolysis, hemicellulose has a random, amorphous structure with little strength. It is easily hydrolyzed by dilute acidor base as well as myriad hemicellulase enzymes. (Annu Rev,2010)

These polysaccharides contain many different sugar monomers. In contrast, cellulose contains only anhydrous glucose. For instance, besides glucose, sugar monomers in hemicellulose can include xylose, mannose, galactose, rhamnose, and arabinose. Hemicelluloses contain most of the D-pentose sugars, and occasionally small amounts of L-sugars as well. Xylose is in most cases the sugar monomer present in the largest amount, although in softwoods mannose can be the most abundant sugar. Not only regular sugars can be found in hemicellulose, but also their acidified form, for instance glucuronic acid and galacturonic acid can be present. (Gibson L.J, 2013)

Lignin

Lignin is a class of complex organic polymers that form important structural materials in the support tissues of vascular plants and some algae. Lignins are particularly important in the formation of cell walls, especially in wood and bark, because they lend rigidity and do not rot easily. Chemically, lignins are cross-linked phenolic polymers. (Timothy J, 2001)

The composition of lignin varies from species to species. An example of composition from an aspen sample is 63.4% carbon, 5.9% hydrogen, 0.7% ash, and 30% oxygen (by difference), corresponding approximately to the formula $(C_{31}H_{34}O_{11})_n$. As a biopolymer, lignin is unusual because of its heterogeneity and lack of a defined primary structure. Its most commonly noted function is the support through strengthening of wood (xylem cells) in trees. Global commercial production of lignin is around 1.1 million metric tons per year and is used in a wide range of low volume, niche applications where the form but not the quality is important. (Esau, 1977)

There are three monolignol monomers, methoxylated to various degrees: p-coumaryl alcohol, coniferyl alcohol, and sinapyl alcohol. These lignols are incorporated into lignin in the form of the phenylpropanoids p-hydroxyphenyl (H), guaiacyl (G), and syringyl (S), respectively. Gymnosperms have a lignin that consists almost entirely of G with small quantities of H. That of dicotyledonous angiosperms is more often than not a mixture of G and S (with very little H), and monocotyledonous lignin is a mixture of all three. Many grasses have mostly G, while some palms have mainly S. All lignins contain small amounts of incomplete or modified monolignols, and other monomers are prominent in non-woody plants. (J. Ralpt, 2001)

Ash

Ash or ashes are the solid remains of fires. Specifically, it refers to all non-aqueous, non-gaseous residues that remain after something is burned. In analytical chemistry, in order to analyse the mineral and metal content of chemical samples, ash is the non-gaseous, non-liquid residue after a complete combustion.

Ashes as the end product of incomplete combustion will be mostly mineral, but usually still contain an amount of combustible organic or other oxidizable residues. The most well-known type of ash is wood ash, as a product of wood combustion in campfires, fireplaces, etc. The darker the wood ashes, the higher the content of remaining charcoal will be due to incomplete combustion.Like soap, ash is also a disinfecting agent (alkaline). WHO recommended ash or sand as alternative to soap when soap is not available (Howard et al, 2002)

Moisture Content

Water content or moisture content is the quantity of water contained in a material, such as soil (called soil moisture), rock,ceramics, fruit, or wood. Water content is used in a wide range of scientific and technical areas, and is expressed as a ratio, which can range from 0 (completely dry) to the value of the materials' porosity at saturation. It can be given on a volumetric or mass (gravimetric) basis.

Moisture may be present as adsorbed moisture at internal surfaces and as capillary condensed water in small pores. At low relative humidities, moisture consists mainly of adsorbed water. At higher relative humidities, liquid water becomes more and more important, depending or not depending on the pore size can also be an influence of volume. In wood-based materials, however, almost all water is adsorbed at humidities below 98% RH.

In biological applications there can also be a distinction between physisorbed water and "free" water — the physisorbed water being that closely associated with and relatively difficult to remove from a biological material. The method used to determine water content may affect whether water present in this form is accounted for. For a better indication of "free" and "bound" water, the water activity of a material should be considered.

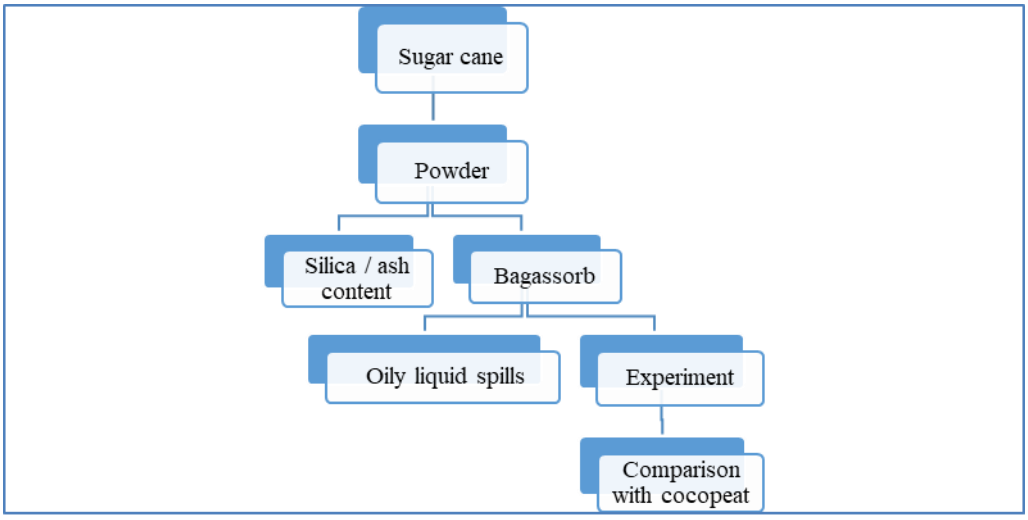


Figure 1: Experimental design of the study.

Bagassorb Process

The main material of this research is sugarcane bagasse. The species of sugarcane use is yellow sugarcane. The resource of sugarcane bagasse is from a hawker at the night market. The first step of the experiment is collecting bagasse. The bagasse are dried using oven dry because it has 45-50% moisture content and consist of a mixture of hard fibre, with soft and smooth parenchymatous (pith) tissue with high hygroscopic property.(Salman, 2015).

Then, the outer skin of must first be discarded because it contains silica that cannot absorb liquid. The grinder machine is used to grind the sugarcane bagasse into a powder form. After that, the 'bagassorb' are ready to be tested.

Firstly, a petri dish is put in an oven to make sure it is totally dry for this experiment. Then the petri dish is weighted to get accurate mass of sample bagasse, coco peat and oil. The bagasse is weighted with same amount of coco peat that is 3 gram. Then, the liquid (lubricant oil) will be measured using measuring cylinder in different volumes (10ml, 15ml, 20ml, 25ml). Each sample is weighted and recorded. Then the bagasse and coco peat samples are poured into 10ml, 15ml, 20ml, 25ml oil respectively and time is taken after 5 and 10 minutes interval. After 5 minutes, the samples are weighted again to get the reading of absorbed oil. The same step is repeated after 10 minutes to get the results.

Separate the inner skin and the outer skin of bagasse

The process was done manually. From 1kg bagasse, after separating the outer skin 0.5kg is left.

Figure 2: The sugarcane bagasse is collected

Figure 3: Separate the outer skin of Bagasse

Drying the sugarcane bagasse

The bagasses was oven dried until the moisture content is below 7%.

Grinding the bagasse

The process is by using blender until the bagasse is fully grinded and become powder form of 0.5mmx0.5mm

Figure 4: The bagasse after being oven-dried

Figure 5: The powder bagasse after being grinded

Testing

An experiment to observe the ability of absorbing between 2 samples bagasse and coco peat was done. Both samples were tested in powder because the existing absorbing product was designed in powder form. We measured the ability to absorb by weighing the mass of the samples after 5 – 10 minutes the samples were mixed with oil. The experiments were repeated with different quantity of oil. The result of this research shows that sugarcane bagasse has an ability to absorb oil even though it is less effective than coco peat.

Figure 6: Sample of weighed bagasse, coco peat and different volume of oil

Figure 7: Samples poured into oil in 5 and 10 minutes

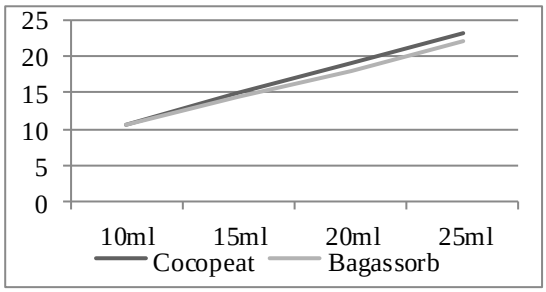
Results and Discussions

The Result of Testing For 3 Grams Samples

Table 1: Result of testing

Time Taken (minutes)	5 minutes		10 minutes	
Volume of Oil (ml)	Weight of Cocopeat	Weight of Bagassorb	Weight of Cocopeat	Weight of Bagassorb
10	10.6g	10.5 g	10.6g	10.8 g
15	14.9g	14.3 g	14.9g	15.3 g
20	19g	17.9 g	19g	19.1 g
25	23.1g	22.1 g	23.1g	23.5 g

Graph of Testing Result



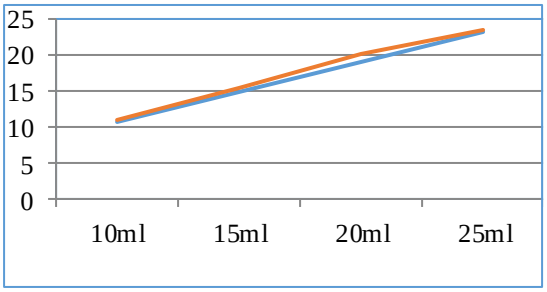


Figure 8: Absorption after 5 minutes graph

Figure 9: Absorption after 10 minutes graph

Results of the testing between bagassorb and cocopeat, shows that it can absorb oil more than bagassorb even for the first 5 minutes in the same quantity. The absorption rate continue to increase after 10 minutes. Although cocopeat is faster in absorbing, bagassorb can be another alternative to cocopeat.

Conclusion and Recommendation

Conclusion

The objective of this research is to utilize sugar cane bagasse in the preparation of absorbing liquid product that is Bagassorb. Bagassorb is useful as it is able to absorb oily liquid spill.

Our objective to utilize sugar cane bagasse in the preparation of absorbing liquid product was achieved. Bagassorb that was made of bagasse with some process to make it able to absorb oily liquid are successful when the powder of the bagasse has the ability to absorb oil liquid spills. The idea of this research is acceptable by users. With some upgrades, Bagassorb may be produced in sachet to be user-friendly.

Bagasse powder produced after grinding the bagasse is too light. The disadvantage of the powder is that it is too easy to be blown when there is wind. But the absorbing effectiveness is more when it is in powder form because the more the surface area, the more oil can be absorbed. To overcome this problem, putting the bagasse powder into a sachet form is proposed.

Recommendation

This research product that is Bagassorb could be in the form of pallet made for the reduction chamber. In the form of sachet is efficient for absorbing oil. Since sugar cane bagasse could easily be burnt, this product could be used as fire starter before and after absorbing oil spills. This can help reduce pollution if the oil is absorbed rather than is throwing it without any consideration for the environment.

Further improvement on this product is by adding other chemicals in order to have better absorbing ability. Certain chemicals can be used to improve the absorbing quality. Further research, many improvements can be made to produce a safer, more economical and efficient Bagassorb.

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BeauHerbs: The Herbal Formulations for Fantastic Effects on Beauty

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The concept of beauty and cosmetics is as ancient as mankind and civilization.Women are obsessed with looking beautiful. Herbal formulations always have attracted considerable attention because of their beneficial and fantastic effects on beauty. BeauHerbs application will be happy to serve you with the natural beauty knowledges, feeds and brilliant tips for the user to apply. The mobile application wil serve the user on the details about the benefits of herbs in beauty. The tips for beauty care based on the herbs in order to satisfy the users.

Keywords: Herbal Formulations, Mobile Application, Beauty Knowledges

The BeauHerbs Application is a platform for the users to know the details about the benefits of herbs in beauty. It will provide best tips for beauty care as beauty hunters and anybody who would like to explore more about herbs in beauty context. This is because most of the people does not know that herbs such as neem, henna and cactus has a lot of benefits. The users also do not know how to use the herbs. The systems are build with fun, easy and motivate the user to use. The system also will allow the user make a review about the product, and view list of review made by other users.

The Related Study

BeauHerbs provide a beauty tips to the people that categorize herbs (neem, henna, cactus) where these herbs are unknown for having a lots of benefits in the beauty context. This application is beneficial since beauty is the one that people now days pay attention to it. Thus, it is a product made from herbs where it is a natural treatment. The website that we refered to create this application is Himalaya website where it is displays and promotes a beauty product that comes from natural resources. Since this application is just a prototype, we plan to further study this project and make it into a real application that can be downloaded at the PlayStore or GoogleStore somedays.

Methodology

Methodology section explains on the method used and the methodology is divided into two: the application development methodology and the survey conducted.

Application Development Methodology

The systems development method (SDM) in which a prototype (an early approximation of a final system or product) is built, tested, and then reworked as necessary until an acceptable prototype is finally achieved from which the complete system or product can now be developed (Figure 1).

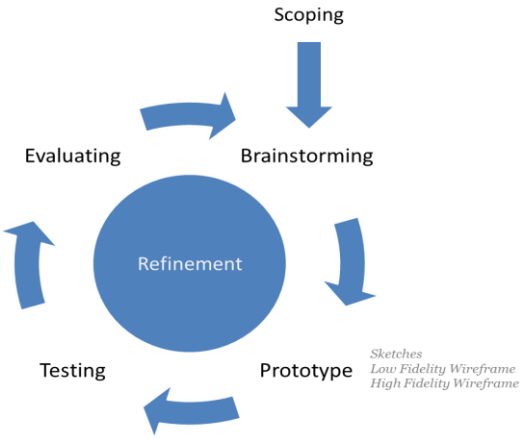

Figure 1 : Prototyping Methodology

It includes the scooping technique by observing the existing application in term of mobile application and website. Then, the findings were analyzed both in terms of its weakness and the strength to come out with the solution to the problem. Next, in the process of designing the prototype application, brainstorming session was conducted to discuss among group members to decide the layout of application. In order to proceed with creating the prototype application information gathering conducted from reliable source and use it to assist in the process of creating the application. The evaluating was made by provide a questionnaire.

The Survey Method

BeauHerbs use questionnaires in order to get feedbacks from the user. The questionnaires survey was distributed to 10 people by categorize them with gender. The data is displayed in the graph bar form to show the results.

The BeauHerbs Application

The BeauHerbs application involves several components which include the selections of categories related to beauty such as face, hair, or body. Then the user can view the Do-It-Yourself (DIY) remedies, and suggested product based on herbs, and gives suggestion or writes a review.

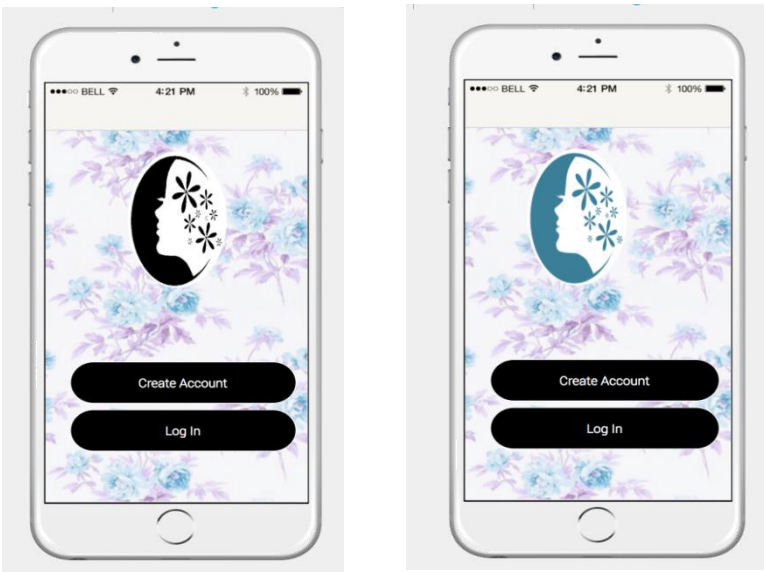

Figure 2 : Main Page

On this screen, the logo is an animated logo where it moves back and forth from right to left. When a move to the right, the logo is in black color and changes to green color when move to the left. User must create account first in order to login to this application (Figure 2).

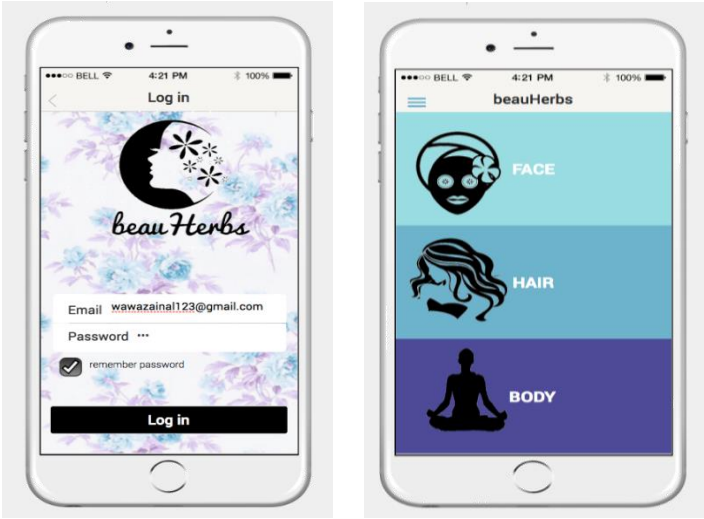

Figure 3 : Login and Menu Page

On login screen, user need to enter email and password. User able to remember password in order to faster the login activity on the next login transaction.When user keyin the wrong email and password, the pop up dialog will pop up the error message. User must key in a registered email and password again as shown in Figure 3. Home screen will appear with slide left transition after successfully login. It has three main categories which are face, hair, and body. At the top left of the screen, the is a menu button.

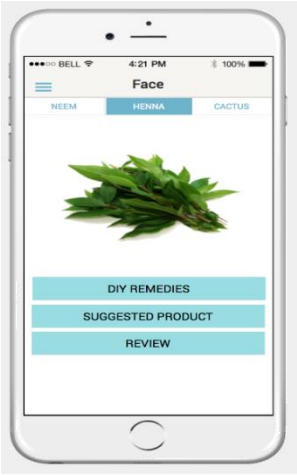

Figure 4 : Category Page

This screen will appear when user tap on face category. It has top menu bar which are three herbs, neem, henna and cactus. This kind of herbs is rarely unknown by public people about their benefits in the concept of beauty (Figure 4).

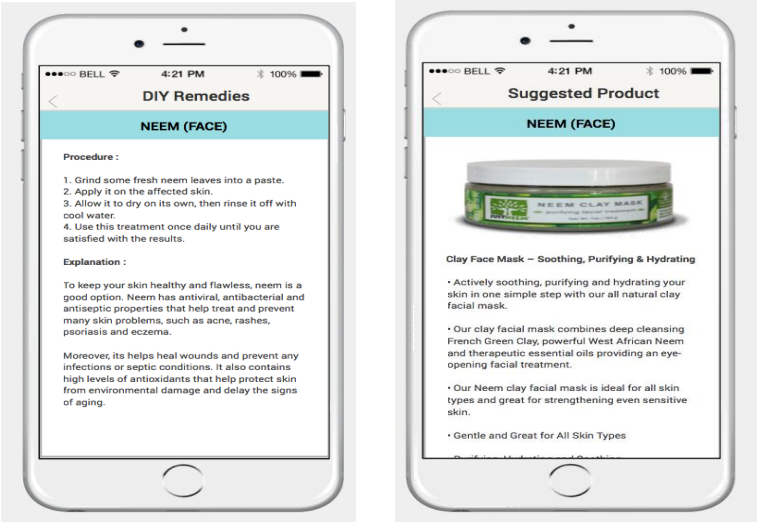

Figure 5 : DIY Remedies Page

On DIY Remedies screen, user can view on how to do with that herb. There are procedure, ingredients, and explanations about the herb. It has button back that link to face home category. On suggested product screen, user can view suggested product related to the herb, the name of the product and description about the product (Figure 5).

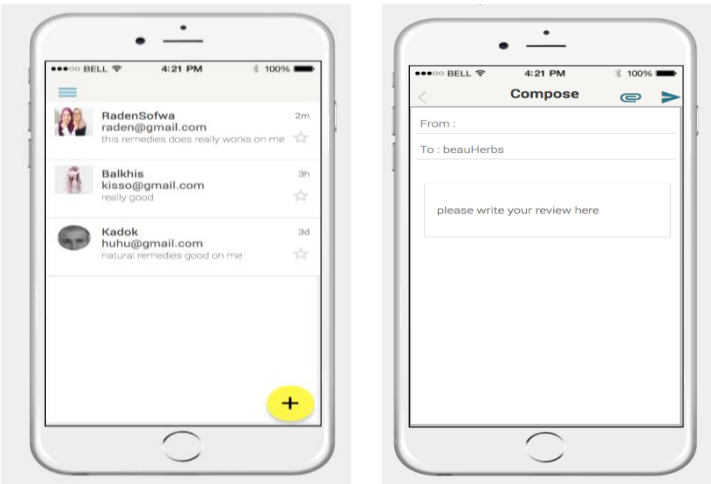

Figure 6 : Write Review Page

User also can make a review about the product by tap on the review button. User can see the list of review made by other users and can tap on the plus button at the bottom right of the screen to add the review. User can write any comments to BeauHerbs and compose it. The new user review will appear on the list of the reviews (Figure 6).

The Survey Results

A survey was conducted to get a feedback from the users on the application developed. The questionaires was distributed based on the questions in Appendix 1. The collected data was analyzed and the findings are as below.

There are 9 out of 10 respondents strongly agree that beauherbs interface design is creative yet simple. its is because on menu screen, there are only 3 main categories that user need to choose based on their preferred (Figure 7). Only 2 respondent disagree that color used in this application is pretty and suitable. it is maybe because the color of font used might be in soft colour so, the unclear vision respondent found out that it is hard to see the text. Most of the respondents agree that the design is neat and consistent. It is because beauHerbs has menu side bar and also top menu bar selection for categories of herbs.

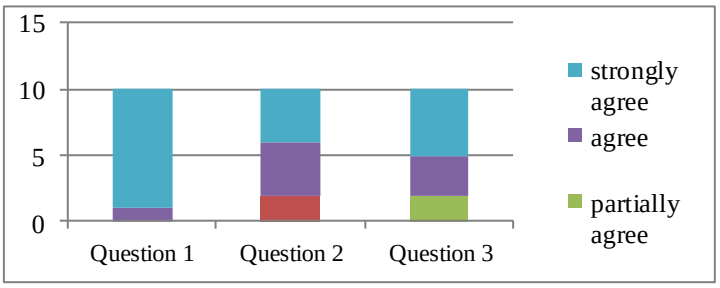

Figure 7 : Design

Based on this graf in Figure 8, both of this question is related to the logic criteria. So, based on the result, it shows that most of the respondents agree that this application is logic in the context of information provided. It is because the information might be applicable for them to applied in their life.

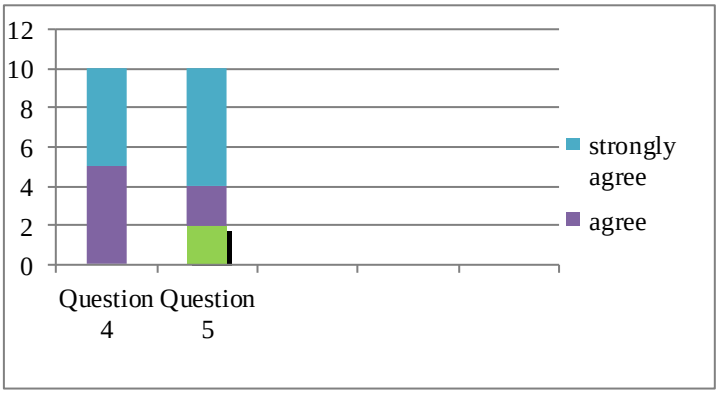

Figure 8 : Logic

The questions related to the content of the application as shows in Figure 9. Most of the respondent agree that the content is understandable since the interface is in the effective mode to deliver informations.

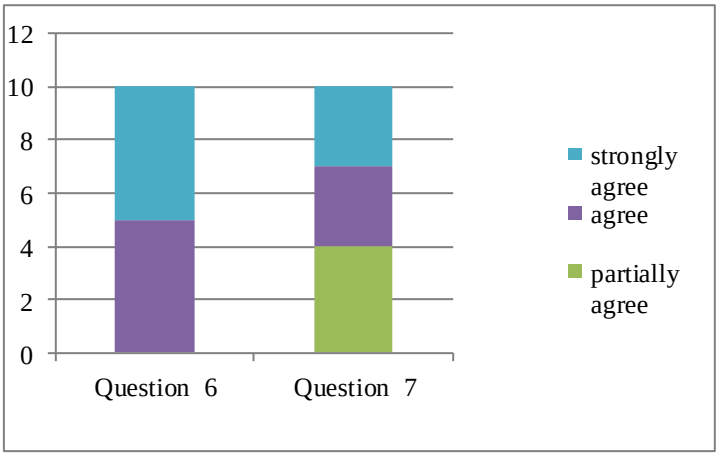

Figure 9 : Content

Based on the graph in Figure 10, there 2 respondents disagree that they cannot keep in track they are in what page. it is maybe they did not know the navigation are provided such as back button. the respondents might not see the back button since the color are unclear. thus, there are not agree. in question 9, most of them agree that the menu button helps them to navigate the screen while using it.

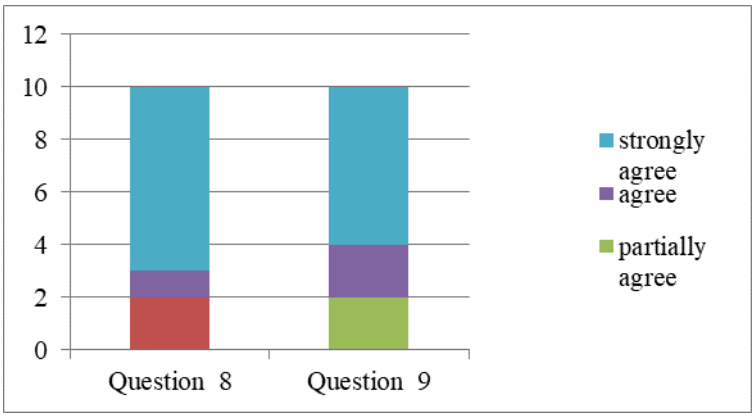

Figure 10 : Navigation

Conclusion

In conclusion, most of the respondent are satisfy when using BeauHerbs application. It might be the design follow the design rule correctly and there is also a lacking in term of knowledge on how to create the best design.

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No	Design	Scale				
1.	The interface design is creative yet simple	1	2	3	4	5
2.	The color used in this apps is pretty and suitable.	1	2	3	4	5
3.	The design is neat and consistent.	1	2	3	4	5
	Logic	Scale				

Appendix 1

4.	The apps is easy to understand.	1	2	3	4	5
5.	The information provided is applicable for me.	1	2	3	4	5
	Content	Scale				
6.	The content is less wording and more icon	1	2	3	4	5
7.	The information satisfy my expectation	1	2	3	4	5
	Navigation	Scale				
8.	I easily know where at what page am I	1	2	3	4	5
9.	The button menu, back button help me to change to other page	1	2	3	4	5
	Satisfaction	Scale				
10.	I feel this apps really easy to use	1	2	3	4	5

Cancer Herbal Cures for Mobile Application

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The purpose of Cancer Herbals Cures application is to those who are looking for simple, natural or herbal cures for cancer diseases with minimal effects. Herbal Cures application offer herbal that use to treat cancer disease. In this application we only provide cures for lung cancer, breast cancer and colorectal cancer. These cancers are among top of cancer at Malaysia. These applications provide type of herbal, information about the herbal, how to use and the contact information. Other than that, user can give feedback and give rating on this application for improvement of our application.

Keywords: Cancer, Herbal Cures, Mobile Application

The Cancer Herbals Cures application will discover herbs that can help user cure them from any disease especially in cancer disease. Discover different natural cures and help patient who suffer from cancer to feel better after try herbal as alternative way and supplement other than medicine that provide from the doctors. This application provides the opportunity to be able to find the natural way of healing. Description about information also provided for each of herbs that display at this apps. This application specific on cancer cures. The user can consult the disease using this application. There are a few types of cancer that can treat through herbals. List of cancer that display at this application are lung cancer, breast cancer and colorectal cancer. These three cancers are top 3 for cancer on Malaysia. All information about the cancer and herbal were provided on this application.

Literature Review

According to the website GetDoc the top 3 cancers affecting both male and female in Malaysia which is breast, colorectal and lung cancer. Cancer occurs more in females than males with a ratio of male to female 1:1.2. We refer these website and book to choose several type of herbs that can treat these cancer. Some of website provides the benefit of herbs. We compare among them and choose the best herbs that cure the cancer. Based on the studies of the existing websites related to cancers, an application was developed.

Methodology

The waterfall model is a sequential (non-iterative) design process, used in software development processes, in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of conception, initiation, analysis, design, construction, testing, production/implementation and maintenance. Firstly, for requirement state we prepare requirement document and prepare use case. Secondly, we design the software architecture and map the stakeholders. Thirdly, we construct the software in implementation

state. Next, we verify the application by installation and testing the application. Lastly, in maintenance we check the errors (Figure 1).

The application development will be focused more on how to optimize the user experience when user used the mobile application and we just develop the prototyping of the application. The graphical interface will be develop using JustInMind Tools.

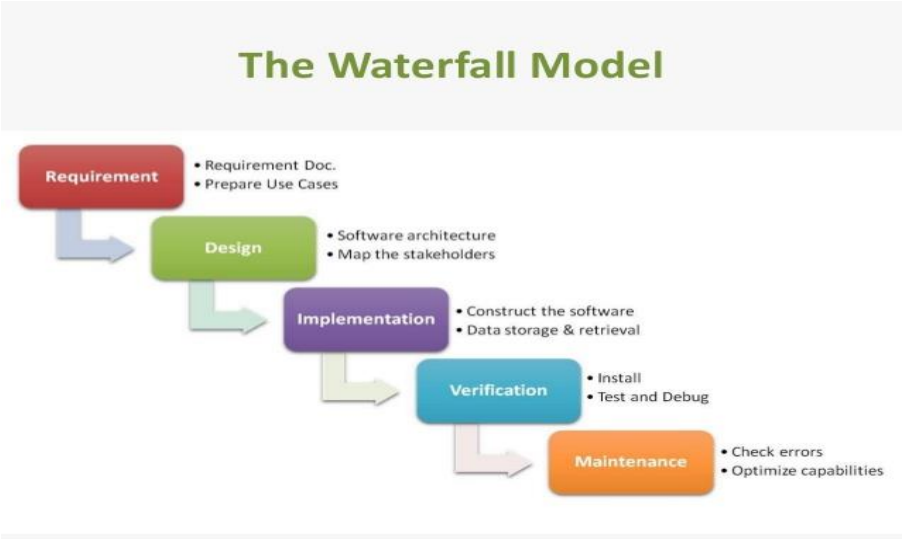

Figure 1: Waterfall Methodology

The Application

In this section the application interfaces is presented. The application was developed to consider for easy to use can satisfy the users in findings the information related to cancers.

Figure 2: Home Page

This is our Home page looks like. User must click 'Welcome' button to go the next page. The application was designed to looks simple so that the user can easily brogse the page (Figure 2).

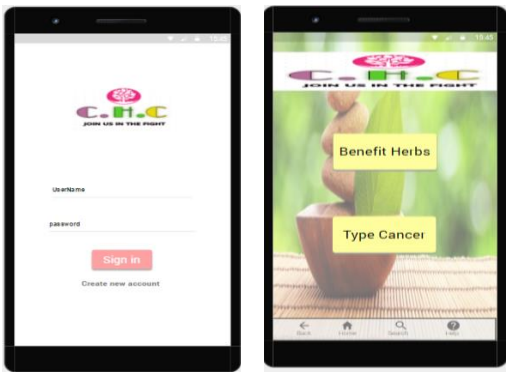

Figure 3: Log in and Introduction Page

This is second page 'Log In' page. User must log in first or create new account for the new user. This is page where user can choose to view benefits of herbs or type of cancer. At the bottom we have 4 icon such as 'Back', 'Home' , 'Search' and 'Help' (Figure 3).

Figure 4: Information Page

This is 'Benefits of herbs' page. User can get more information about benefits of herbs here. For this page, we provide 3 types of cancer which is the top 3 cancer in Malaysia. User can choose any of three to get know what type of herbs can cure that cancer and more about that cancer. This is one of type of cancer page and for each cancer we had prepared 3 types of herbs that can treat that cancer. All the 3 button are the types of herbs that can cure for that cancer. This is one of 'Type of Herbs' page. Here user can know more deeper about the herbs, how to use the herbs like steps to make the herbs to be a health drinking and we also provided the location of supplier of that herbs and user can view by navigate the map (Figure 4).

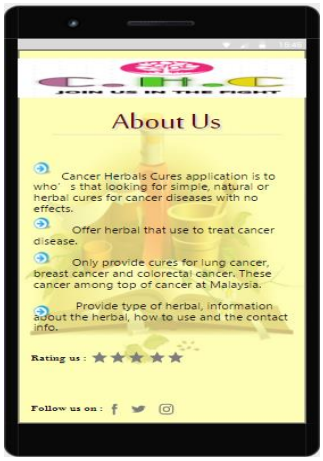

Figure 5: About Us

This is 'About Us' page contains overall description about what this application had provided and user also can give rating for this application (Figure 5).

The Survey Results

The application developed was evaluated by conducting a survey to ge a feedback from the potential users. There ar two aspect was evaluated, which are on the user satisfaction and easy to use.

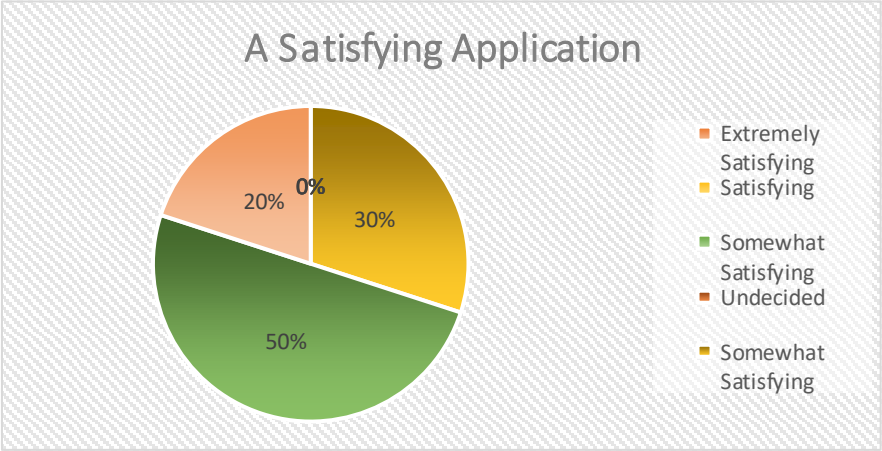

Figure 8 : Result for User Satisfaction

The result shows that 30% of the respondents rate for 5 that the application is somewhat satisfying. 50 % of the respondents rate for 6 and only 20% of the respondents rate for 7 which means extremely satisfying to use.

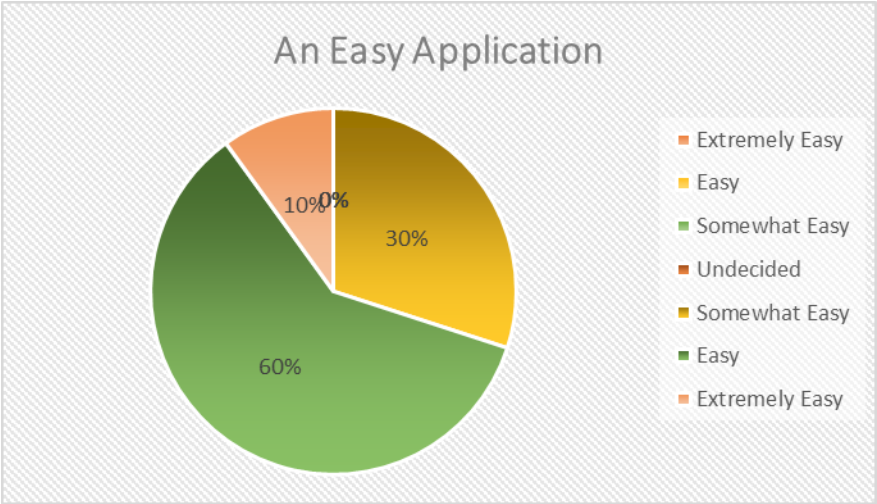

Figure 9: Result for an Easy Application

The result shows that 30% of the respondents rate for 5 that the application is somewhat easy to learn and study. 60 % of the respondents rate for 6 and only 10% of the respondents rate for 7 which means extremely easy to learn and study.

Conclusion

There are many traditional medicines in the world to cure cancer. Three types of herbal are provided in the application for breast cancer. The herbal which garlic, amygdali and ashwagandha were proven can fight breast cancer in lab studies and the World Health Organization's also suggest to eat a clove or two of garlic. There are different herbs suggested in the mobile application for each type of cancer. This application enable user to get some help in finding herbal to treat the illness which focusses on three types of cancer which is breast cancer, colorectal cancer and lung cancer. The mobile application aided user with the information of the herbal, type of herbal, how to use and the contact information. User also can give feedback and give rating on this application for the future improvement.

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The Clover: Herbal Soap Guidance System for Product Commercialization

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The Clover is an Herbal Soap Guidance System that specially made for the supplier of herbal soap product to commercialize their product. The Clover make a platform for the supplier to gives information about their product in the system. The supplier also can be located at the address or contact number provided in the system. The supplier also has their own account in this system and they will be the administrator of the system. They also can edit the product based on their stock. The Clover also gives the customer opportunities to communicate with the suppliers in the review page. They can comment and also get the product from this system. Hence, the customer will not be worried about being cheated by the supplier because they can locate the supplier.

Keywords: Herbal Soap, Commercialization, Guidance System Application

The herbal soap guidance system is a platform for the suppliers of herbal soap to commercialize their product. Customers also can directly buy the product from the supplier using this system. From the study, the user having problem as they they did not know where to get a product. Therefore, it is time consuming for them to search the place or website where the herbal soap being sold. The objective of the paper is to present the system that helps the user to get the herbal soap directly from the supplier. The system is built with fun, easy and motivates the user to use. The system also will provide the location-based and detail supplier information for the customer.

Related System

As the number of herbal plantation is growing rapidly nowadays, we can see that the supplier of herbal plant want to commercialize their herbs in another field. Which is herbal soap that getting more popular. People start to know the benefits of herbal soap. It does not only to keep the user clean but also healthy because each types of the herbal soap have different function. It depends on the type of the skin that the user of the herbal soap has. Before The Clover being develop, we make the Mountain Rose Herbs as our guidance. We take a look at the way they commercialize their product. The Clover have some function that almost the same with the Mountain Rose Herbs but we improvised it to become a platform for all the herbal soup supplier that searching for a place to commercialize their product. So basically, our application will give more benefits for the user and also the supplier. We help the all of the supplier to compete in a healthy way in this application. The customer doesn't have to go to each store to buy the herbal soup. They just have to stay at home and use The Clover application to contact the supplier to buy the herbal soap. Therefore, both parties got the benefits. The supplier will gain the number of customer and the customer will save their time.

The Methodology

This part will provide a discussion of the chosen methodology for the application development. The necessary data and information to address the application objectives and problems are collected. Prototyping method is used to develop the application. Prototyping methodology is used as early sample or for testing a concept or process. The early stages of the proposed application are suitable with prototyping method as it supports in making evaluation and receive feedback from the evaluators. They can see, hold, and interact with a protoype more easily than a document or drawing. The aspects that are included in prototyping are the technical issues, work flow, task design, screen layouts, information display and difficult and critical areas in the development.

The Herbal Soap Guidance System

Basically, the system will show the logo of the system to attract the user. The meaning of the logo is many and one of the meanings is hope. Hopefully the system will get through the market and stands like the other application that already famous in herbs industry. The second meaning of the clover is faith and we have faith for this system. The third is love. It is hope that the customer will love this system and make this system as number one choice. The last is luck. From all the hard work to build this system, we wish to have a good luck for this system.

Figure 1: Main Page

This is the home page for this system. In this page, the suppliers will promote their product or the promotions that they made or anything to promote their products. This page is more likely the poster or announcement from the supplier. This page also has the icon for the supplier to enter their page. The icon is beside the welcome words and it can be easily seen by the suppliers. In this page, the icon for the home, about us, products and locate us are provided. So that, the user can easily go to the page that they want. We don't just put the icon but a we also write the function of the icon so that the user will not get confuse what is the meaning of the icon and the time consuming is reduce for searching for the right page (Figure 1).

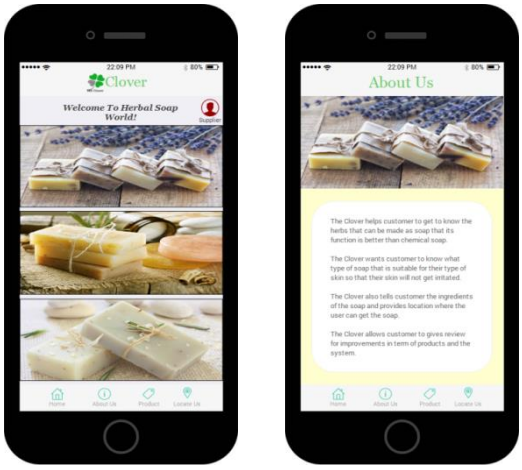

Figure 2: Information Page

The system will provide the information of our system and what is the function of the system so that the customer will not get confuse what we are doing (Figure 2). We are not selling the product but we provide a platform for all herbal soap suppliers to sell their products. In this page, the icon to go to the other page also provided. The user can swipe the screen for turning back to the previous page.

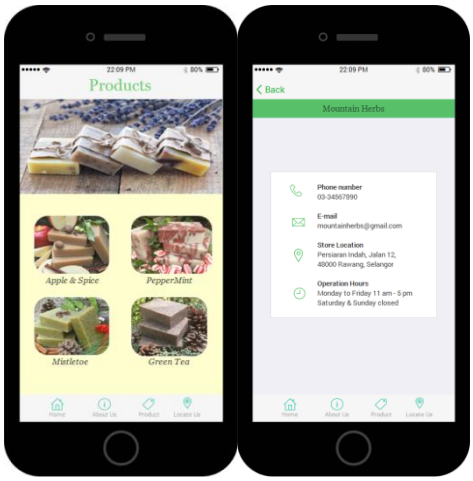

Figure 3: Products and Suppliers Information

This is view for the user about the products (Figure 3). The entire product that sold by the supplier will be shown here to make the customer easy to search for the product that they want. The customer can click on every product that they want to know the detail of the product. This page also provides the icon to go to the other page that the user wants. For turning back to the previous page, the user can swipe the screen to the right and the page will go to the previous one. This page is the Locate Us page which is the page to see the list of the supplier that The Clover have. When the customer clicks the supplier's name, they will be directly go to the page where the information of supplier is given.

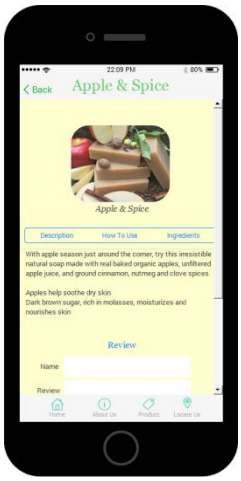

Figure 4: Product Descriptions and Reviews

This page will show the whole description of the product. There is 3 buttons to go to each description. The three button is description, how to use the product and the ingredients of the product. In this page, the customer will write a review about the product. They will type their name and also the comment that they want to give to us. Once they click the submit button, the page will show a dialog box to tell user that their review is accepted. The review will be seen by the supplier in the supplier page (Figure 4).

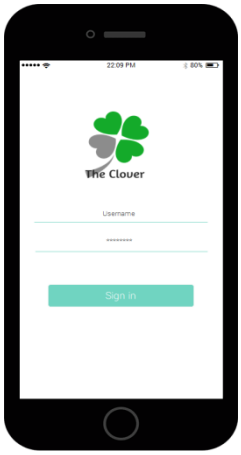

Figure 5: Suppliers Log in Page

When the supplier clicks the supplier icon, this page will show up. This page is the page where the supplier has to put the username and password to enter the suppliers' page. Once the supplier click the button sign in, they will directly enter the supplier page. If not succeed, they have to re-enter the password and username again. This page will is just an informative page. The user will get the contact number, email address, the location and the operation hours of the supplier (Figure 5).

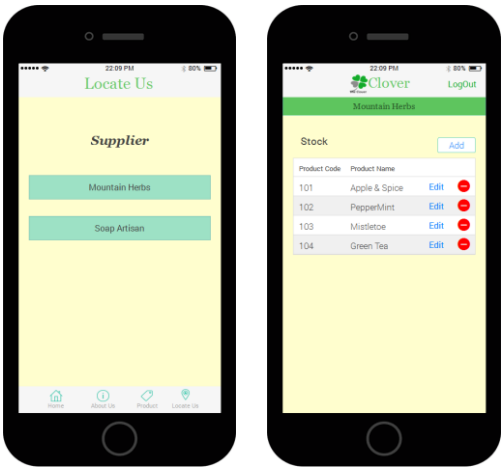

Figure 6: Suppliers Page for Manage Products Information

This is the list of products that the supplier have. They will edit, add and delete their product from here and there will be changes in the customer's product page as shown in Figure 6. The table have the code of the product and the product name. When supplier click the add button, it will go to other page.

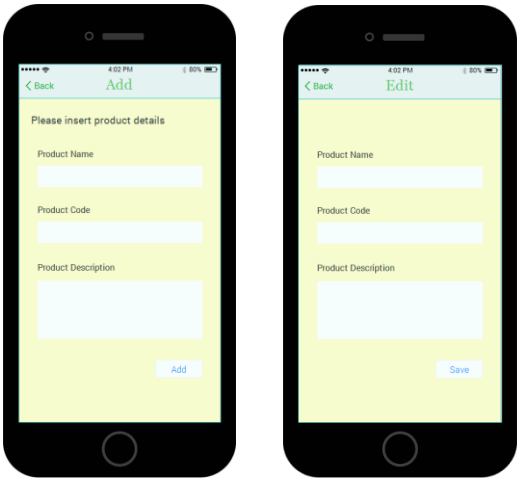

Figure 7: Suppliers Page for Information Editing

This is adding product page. The supplier will put the product name, product code and the product description. When the entire column is full, they will click the add button and the product will be added in the product table. For the editing page, the concept is the same as the add page but in this page, if the supplier only want to fill one column then only the column will be change. The changes will be seen in the product table. When the changes is made, the supplier can click the save button and the page will be back to the product table page.

Conclusion

Based on the evaluation that had been done, many agree that the herbal soap guidance system is truly helpful to both the user or customer and supplier. The features provided in the application such as review and ingredient list allows the customer to gain their trust towards

the product and the supplier. This eventually boosts the sale for the supplier that is registered to the application.

The feature that needs the supplier to register first to the application leads to the ease for the admin and supplier to manage their product. The review feature is helpful not only helpful to the customer but it is helpful for the supplier to see the comments from the customers about their soap. In the end, the application gives benefit to both customer and supplier.

iCook Herbs Application: Sharing Platform for Cuisine Preparations

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Universiti Putra Malaysia

Nowadays, most of the people do not know that the herbs can be used as ingredients in cuisine and hardly find the suitable recipe that consume specific herbs that they want. They may have an idea on how to make new cuisine but there is no platform to share their recipes. Therefore, there is a need of a medium to sharing new idea on recipes that consume herbs only. ICookHerbs is a web based application for the user to sharing their idea on new recipes consumes herbs as the ingredients. The system is consisting of recipes based on herbs and information of specific herbs in cuisine. The system is capable to provide a platform for user to share related idea of new variety of herbs recipe. The system is easy to use and also aids the user for searching the recipes that related with specific herb.

Keywords: Herbal Formulations, Mobile Application, Cuisine Preparations

iCookHerbs is a web based application for the user to sharing their idea on new recipes consumes herbs as the ingredients and also provides the information of specific herbs in cuisine. The problem is, there are less people knows that herbs can be used in variety of recipes and hardly find the suitable recipe that consume specific herbs that they want. Therefore, there is a need of a medium to share new idea on recipes that consume herbs. The application is capable to provide a platform for user to share any idea of new recipe that consume herbs.

The system development includes the observation technique by observing the existing application in term of mobile application and website. For example, several web sites involved such as MyCookbook, https://www.mycookbook-online.net/ and FoodRecipes Network, www.foodnetwork.com . Then, the findings were analyzed both in terms of its weakness and the strength to come out with the solution to the problem. Next, in the process of designing the application, brainstorming session was conducted to discuss among group members to decide the layout of application. In order to proceed with creating the application information gathering conducted from Prof Dr. Rusli Abdullah and use it to assist in the process of creating the application.

Related Application

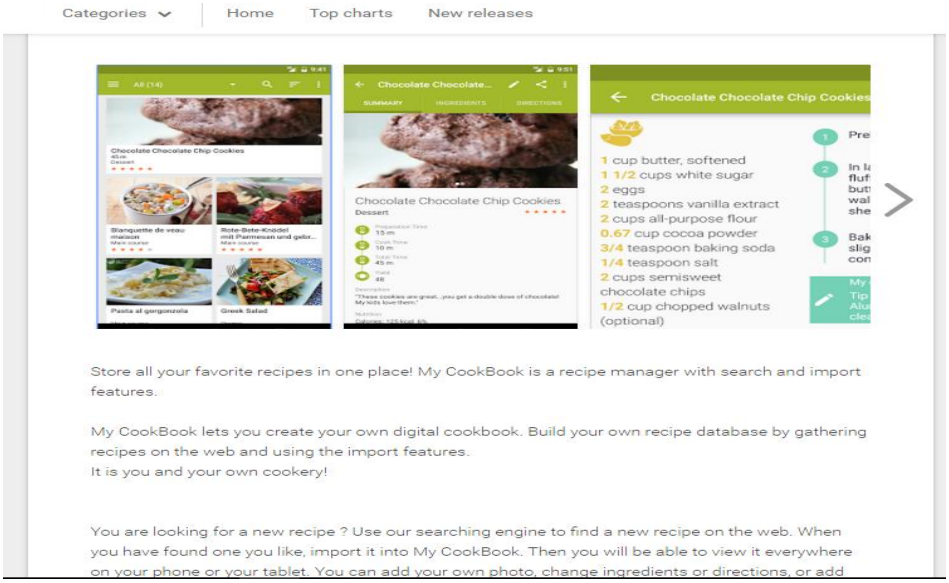

Figure 1: MyCookBook application

Figure 1 shows the existing application that referred before proposing the iCookHerbs application. In MyCookBook application, it allows user to create their own digital cookbook by gathering recipes on the web and use import features. User is able to import their favorite's recipes from the website into MyCookBook application so that they will be able to view it everywhere they are. This application is on general genre recipes that do not consent on recipe that consume herbs.

Methodology

iCookHerbs application developed using two approaches: observation and brainstorming. In order to study on system requirements, the observation technique involved for existing mobile application that provide digital cookbook and recipes. Next, brainstorming session was conducted to discuss among developers group on deciding the usable and meaningful of layout application to users. Then, the process is to proceed with creating the iCookHerbs application by gathering information from expert such as herbs specialist and dietitian.

The Application

Figure 2: Main screen

The main screen will appear to the user as shown in Figure 2 when the application started. In the main screen there are three menus options: Recipes, Herbs and Add Recipes menu.

Figure 3: Recipes menu screen

When the user chooses the recipes option all the available recipes will appear. For example Figure 3 display the menu of the recipes and it include images so that it able to attract user interest to choose any of the recipes that they like.

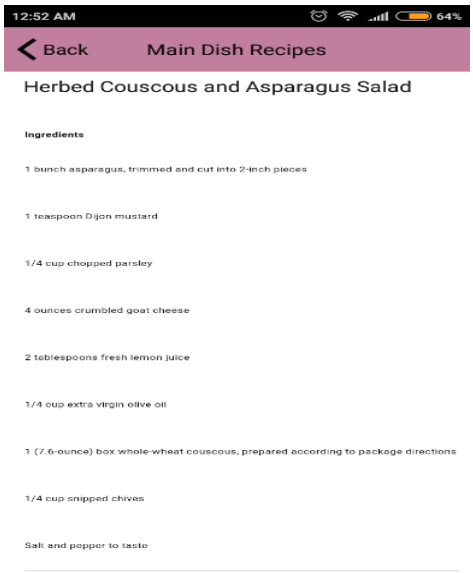

Figure 4: Main dish recipes screen

The user able to see recipes of the main dish that they had select from the previous recipes menu screen. In Figure 4, it shows the ingredients used to make this recipes and on how to make it step by step.

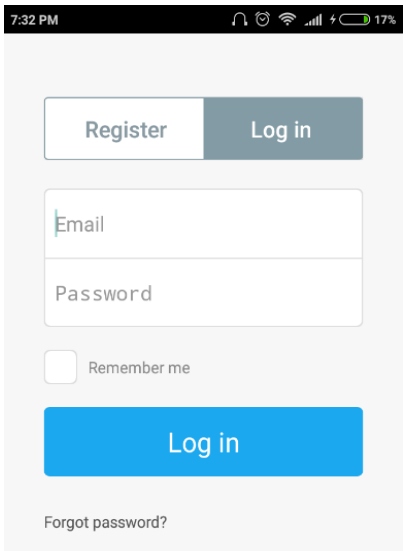

Figure 5: Log in screen

The users need to log in first if they want to add new recipe. Figure 5 above shows the login screen where the user need to login in order to able add new recipes. The users need to enter their registered email and password.

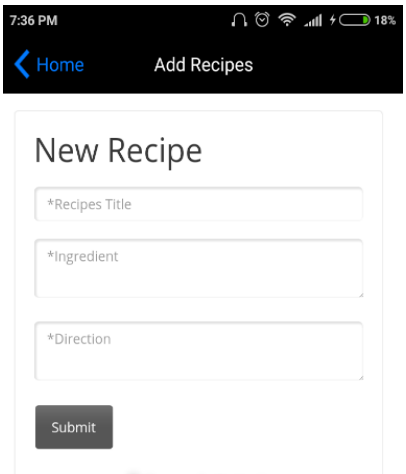

Figure 6: Add new recipe screen

Figure 6 allowed registered user to add new recipe that consume herbs as ingredients to be shared to other user. User need to insert the title of the new recipe, ingredients used and steps on how to make the recipe.

Conclusion

In conclusion, iCookHerbs is a web based application that easy to use and meaningful to the users. iCookHerbs is as a platform for users in order for sharing their ideas on recipes and information of specific herbs in cuisine. Through the evaluation from the users, there are needs some improvements and adoptions in getting improve the usability and workflow of iCookHerbs. The feedback will be take consideration in order to acquire better solutions for improving the future development of iCookHerbs application.

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Extended Abstract

Proposed Topic: Well-Being and Enhancing Food Security: Measuring What Matters to Agricultural Communities

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Introduction

Well-being as a concept is an emergent and useful measure of human progress and sustainable livelihood. It is a new science that has recently moved to center stage as a means of gauging social, cultural and economic development. Globally, the idea has caught on and moved beyond Gross Domestic Product and per capita income. Well-being is examined through its various dimensions that could be both objective and subjective which complement one another. Food Security and Sustainable livelihood are concepts that resides well in well-being as they promote prudent and wise use of resources for continued living within a well-being economy. In essence, a well-being economy focusses on equitable and fair sharing of the benefits of economic growth, promotion of a green development and contending with measuring and monitoring of useful indicators that focusses on what really matters to the populace. In finality, what are measurable can easily be translated into policy, whereas what are not measured are often neglected. Nowadays, more popularly, well-being is measured via happiness rankings which list indices of happiness as a positive emotion or satisfaction with life. Worldwide, many global rankings prevail, whilst individual countries have developed their own measures. In Malaysia, well-being research is nascent and the author's current emphasis is on verifying a proposed model and refining well-being dimensions towards realizing a national index of well-being, happiness and wisdom. Being measurable would lead to well-being to be included in policies that bear upon social, cultural, economic, political and sustainable outcomes.

Moving Beyond GDP Measure

The Gross Domestic Product (GDP) measure of economic progress as propounded by Simon Kuznets since the 40's has shown that it is inadequate to accurately reflect the human condition. GDP does not account for the non-priced items that affect daily livelihoods. In human development, the focus is on promoting and capitalising on the human potential. At the same time, total human development entails several aspects including physical and biological, psychological, mental and spiritual.

This is where Well-Being measures are better estimates of the right things to be accounted for. More recently, Well-Being has come centre stage and fast becoming the benchmark for reporting national development and human development. Many countries have stated the

move, beginning with the Bhutan Gross National Happiness standard, Indonesia's Well-Being Index of Indonesian Population (IKRAR), the Legatum Prosperity Index, the Social Progress Index and World Happiness Report (Heliwell). Malaysia had introduced its own Malaysian Well-Being Index in 2013.

Why Well-Being?

There is evidence that objective and subjective well-being are what really matters for people, whose situations are more and more disconnected from GDP.

Many aspects such as psychological, spiritual and environmental sustainability are not at all accounted for by GDP. Un-measurability means invisibility, or, as the saying goes, "what is not measured is not managed". Measuring is governing and the chosen indicators determine policies and actions.

In order to enhance Well-Being, there have been many recent efforts to examine and benefit from well-being theories and concepts as reported by many scholars (see the works of Seligman, Layard and Sulaiman et. al.). Seligman had introduced the PERMA theory of Well-Being of 1) Positive emotion, 2) Engagement, 3) Relations, 4) Meaning, and 5) Achievement. Possessing or pursuing the five traits could ensure the Well-Being of fellow humans.

Sulaiman had promoted the Islamic perspective of Well-Being in that the primary aim of life for human beings as described in Islam are to achieve happiness (*falah*), and, to achieve ultimate success gain the pleasure of Allah. Al Ghazali had described the means by which man could prepare for happiness in this world and hereafter (*sa'adah*) via caring for his soul (*al-nafsiyah*), his body (*al-jismiyyah*), doing external good (*al-kharijiyyah*) and seeking divine grace (*al-tawfiqiyyah*).

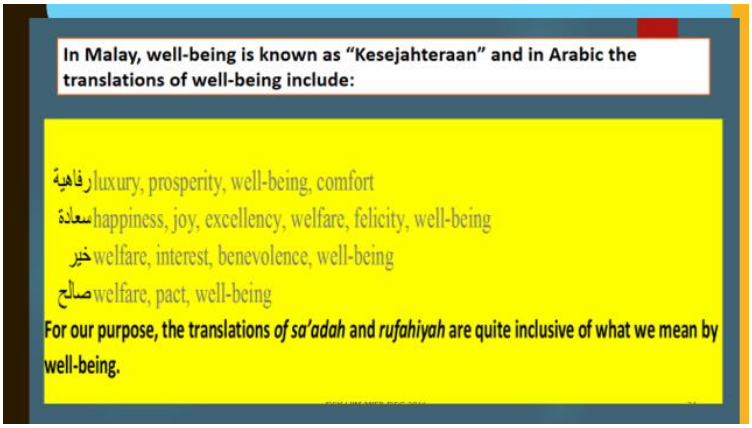

Figure 1: The Meaning of Well-Being

Social Net and Food Security

If one examines the United Nation's 2030 Sustainable Development Goals, most of the dimensions listed are very much linked to Well-Being in the short or the long run. Very much hinges upon the pursuit of Well-being by ensuring that those determinants of Well-being are well accounted for in development strategies and policies.

More importantly, the most pertinent determinants of Well-Being are income, employment, social nets, social capital and the environment. Food security is a major concern because it is an important basis for a secured social net. Furthermore, food security strategies are directly linked with employment and the preservation of the environment.

Quo Vadis Well-Being in Malaysia

Well-Being has evolved to be an important consideration in policy-making, especially as it relates to food security and the sustainable livelihood of the agricultural community. Central planning should have a Well-Being economy in mind whereby the determinants of Well-Being are given priority focus and not necessarily mere economic growth. Well-Being outcome measures has to be accepted as significant benchmarks in the evaluation of success, just as economic and other outcomes.

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Extended Abstract

Walking the Tightrope: Perils and Rewards in Delivering Food Security to the Nation

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Introduction

Rice is the staple food for most Asian countries, whereby about 90% of rice is both grown and consumed in this continent. Countries all over the world would generally have a dedicated institution to implement the policies and programs to ensure security of their staple food to their population (Tobias et al, 2012). Malaysia is no exception in this regards, except that in Malaysia, this dedicated institution is a private entity, which comes into being when the National Paddy and Rice Board, popularly known through its Bahasa acronym LPN (*Lembaga Padi dan Beras Negara*), was privatized into Padiberas Nasional Berhad or BERNAS. The privatization looks cozy to the outsiders, a perception not entirely unjustified, for in many cases and in most years, profitability is already guaranteed. But this privilege of being the sole importer comes at a great cost, not only financially in terms of the fulfillment of the mandated social functions, but more importantly in the headache of managing conflicting interests. Not only that BERNAS has to make sure that farmers and consumers get what they want, but, at the same time, BERNAS also has to make sure that those along the industry supply chain, namely rice millers, wholesalers and retailers would have sufficient margin for them to continue with their respective businesses (Jegatheesan et al, 2001). And, along with all these, BERNAS has to contend with numerous misperceptions and multiplicity of expectations, many of which are against the commercial concerns (Muhammad, S., 2013).

Methods

As this is not an experimental or an empirical study, the so-called primary data would be the author's own experience in BERNAS for the last 20 years. This includes the various tasks he has undertaken which formed the basis of his understanding of BERNAS' delicate role, as well his long association with others in the industry, whether in the same company or outside of BERNAS, which enriched and validated his understanding of the matter. Secondary data are the various published literatures relevant to the topic.

Findings and Argument

Corporatization (1994) and privatization (1996) of LPN into BERNAS saw that the grain management agency tasked with delivering food security to the nation changed from

public to private hands. With the exception of regulatory function, which was given back to the Government, the roles and responsibilities which hitherto had been under the ambit of LPN were transferred to BERNAS (Muhammad, M.D.A., 2013). The three prong paddy and rice industry objectives, namely (1) to ensure food security to the nation, (2) to ensure supply and price stability, and (3) to support farmers' income, have largely been relegated to BERNAS. In return for this monumental task, BERNAS is given the status of the country's single importer, taking over similar role from its predecessor (Final Report, MoA, 2004).

The model is essentially one of cross subsidy. Profit margin from import operation is used to finance the expenses required to ensure that farmers will always find market for their paddy at desired prices, consumers will have sufficient supply at stable and reasonably priced rice, and the market is dynamic enough for industry players from service providers, rice millers, wholesalers and retailers to carry out their respective businesses. This model sounds simple enough, and considering that BERNAS only made financial losses twice since its privatization, in 2003 and in 2008 respectively, managing BERNAS seems to require no brain, as many seem to suggest.

Those who are directly managing BERNAS, however, would view the matter somewhat differently. Making reasonable profit is not difficult, but the easy part stops there. Firstly, BERNAS' role is to satisfy conflicting objectives. On the one hand, farmers want high price for their paddy; on the other, consumers want cheaper rice. As should be apparent, cheaper rice cannot be delivered if paddy, which is the raw material for producing rice and constitutes about 90% of the total cost, is expensive. Should BERNAS favor one party, the other would be unhappy. But if BERNAS attempts to be fair to both parties, none would be all too happy either. In the end, BERNAS would be anathematized regardless of what it does. And whatever it does, there are always people who cry foul that BERNAS does not help farmers, as there are those who cry foul that BERNAS does not help consumers and other players in the industry. Over the last two decades, experiences suggest that more noises come from producer side, either directly from farmers themselves, or more likely from those championing the farmers' cause. This seems to relate well with higher weight accorded to the industry objective of farmers' income, at 70% according to the monograph published in 1986, which seems to be valid until now. For food security and price stability, each is given 20% and 10% weight, respectively (Mustapha et al., 1986).

Secondly, the difficulty in balancing conflicting interests is amplified by the fact that Malaysia is deficit in rice and has to rely on imports, which fluctuate over time. Malaysia is also a high cost producer, neighboring to Thailand, traditionally the largest rice exporter in the world. This unique mixture allows BERNAS as the nation's sole rice importer to capitalize on the domestic production inefficiency, but it also exposes the country to double jeopardy. The first is the influx of smuggled rice from the neighboring countries, especially Thailand, which hurts the domestic farmers, and threatens the survival of domestic production. The second is the price spike, which hurts the consumers, and threatens the security of staple food especially to the poorer segment of the population. In both cases, BERNAS has to step in to mitigate these impacts. The impact of smuggling tends to linger

for a few years. The impact of price spike, in contrast, tends to be of shorter duration, but generally more acute.

Since BERNAS privatization in 1996, the country has been hit by the smuggling menace twice. First was from 2000 to 2002, resulting from the benchmarked free-on-board (FOB) prices being at the all-time low (Thai White Rice 5% broken (TWR5%) around USD200/MT). Impact to BERNAS may be seen from its imports, which came down to 478,000 metric tons (MT) in 2002 from the high of 654,000 MT in 1998. During this period, BERNAS was forced to cope with more paddy than it could handle, since other rice millers were selective and cautious in their paddy purchase. Farmers' income was also affected, as paddy prices went down closer to the prevailing Guaranteed Minimum Price (GMP) of RM550/MT. Before the menace, paddy prices revolved around RM600/MT or higher, except in the East Coast, where market prices for paddy tend to be lower and closer to the GMP. The country, however, managed to sustain the domestic rice production, with BERNAS playing its role as the buyer of last resort, mopping out not only excess paddy not purchased by other rice millers, but also unsold rice from other rice millers because of the rice glut.

The second time is what the industry is currently experiencing. The smuggling menace began since 2014, due to multiple factors. First is the collapse of Thailand Rice Pledging System in 2013 (Permani and Vanzetti, 2014), when huge stock of rice in Thailand was auctioned and this flooded to the border. Second is the result of fixing paddy price at RM1,200/MT in early 2014, amidst the trend of international prices going down. This time around, since paddy price is fixed, farmers' income is not affected, but BERNAS and the industry players, especially rice millers, are severely wounded. BERNAS' annual average import went down to 856,000 MT (annual average for 2013-2016) from the annual average of 1,024,000 MT (2008-2012), with 2016 registering the lowest since 2008, at 747,000 MT. Because of paddy high price, most private rice mills in Kelantan and Terengganu were forced to close down their operation, with the consequence that BERNAS rice mills are forced to buy practically 100% of the paddy produced in this region.

As for the price spike, this also happened twice since privatization. The first incidence was in 1997-1998, which was due Regional Financial Crisis rather than price fluctuation. Beginning with Q3 1997 and peaked by early 1998, Malaysian currency dipped to MYR4.725 against USD, from MYR2.5, before it was finally pegged at MYR3.8 by September 1998. On average, due to the weakening of Malaysia Ringgit, international prices of rice went up by 60% but prices in domestic market were contained with an increase of only 30%. BERNAS took a dip and managed only to break even in 1998. Despite some noises made over price hike, Malaysia actually fared much better than our counterpart. In Indonesia, this Regional Financial Crisis turned into food crisis where people were rioting for a few months in big cities over price hike and basic food supply went missing (Soekirman, 2001).

The second incidence was in 2008, which was more acute and required Government intervention in the form of Government Subsidized Rice (GSR). This time, the crisis was due to international prices going up by 300% within a few months (Dawe and Slayton, 2010).

This price spike went into crisis mode largely due to the panic reaction by the Philippines, who reacted against India's ban of white rice import and the zig zag reaction of Vietnam (Slayton, 2009). Together with the Government, BERNAS managed to prevent the domestic price spike from becoming an acute crisis. Overall prices in the domestic market did go up by 50% and BERNAS made huge financial loss in 2008, but comparatively we fared even better than Thailand, historically the largest rice exporter in the world, for their domestic prices went up by 105% (Titapiwatanakun, 2012).

Finally, managing BERNAS is like walking a tightrope because there are a lot of misgivings, misperceptions and misplaced expectations about BERNAS. These largely rest on the misunderstanding of the gatekeeping mechanism, made possible through the single importer policy, which is required by the country in order to protect farmers' income, to sustain domestic production and to ensure the security of the staple food to the population. Instead of looking at single importer as the nation's gatekeeper, some quarters look at it as a lucrative hand-out, calling upon the Government to dismantle the single importer policy, arguing that multiple importers will boost competition and will benefit all. What they seem to forget is that the single importer policy was created in 1974 precisely because the multiple importers had failed to bring in rice during World Rice Crisis of 1973, which threatened the country with insufficient supply, forcing the Government to purchase on their own. In contrast, BERNAS as the nation's single importer still brought in sufficient rice during World Rice Crisis 2008, and for many months sold them at half the cost price, resulting in huge financial loss. Furthermore, if single importer policy is dismantled, the question will arise as to who will play the role as the buyer of last resort and thereby protect both farmers' income and domestic production during domestic rice glut, as the industry has been experiencing since 2014, due to the influx of smuggled rice amidst high domestic paddy price.

Conclusions

Delivering food security to the nation is never simple, and BERNAS is not alone in having to walk on the tightrope. Bruce et al (2011) has beautifully captured the essence, the complexity and the high operating cost of the National Food Authority (NFA), being the caretaker of food security in the Philippines. Timmer's musing during his acceptance speech for the Leontief Prize for Advancing the Frontiers of Economic Thought (2011), his reflections on past food crises (2010) and his relook on food policy analysis (2013) provide a glimpse on the complexity of the matter. The question "how much can the market be relied on to provide food security and how much should the government intervene on behalf of this objective?" is a standard debate every time there is food crisis. By privatizing LPN into BERNAS, Malaysia has made a conscious choice by trusting the most important institution delivering food security to the nation to be in the private hands, with Government to retain control on policy matters by virtue of the Government having golden shares in BERNAS. Ever since it was privatized, BERNAS has been grappling with the question of how much it

should behave commercially and how much social-politically, with the end result that BERNAS is often perceived as not being commercial enough despite being private, and not doing enough to help farming community in particular and the nation in general, as what a food-grain management company allegedly should do.

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