International Journal of Engineering Sciences & Research Technology

(A Peer Reviewed Online Journal)
Impact Factor: 5.164

IJESRT

RESEARCHERID
THOMSON REUTERS

[Parwati *et al.*, 9(9): September, 2020]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

THE IMPACT OF DIVERSIFICATION OF SANDALWOOD RED RICE PRODUCT ON THE IMPROVEMENT OF LOCAL ECONOMY IN MENGESTA VILLAGE

Ni Nyoman Parwati*[1], I Gusti Putu Suharta[2] & Anantawikrama Tungga Atmadja[3]
*[1]Department of Mathematics , FMIPA, Undiksha
[2]Department of Mathematics, FMIPA , Undiksha
[3]Department of Accounting , FE, Undiksha

DOI: https://doi.org/10.29121/ijesrt.v9.i9.2020.3

ABSTRACT

Sandalwood red rice is the superior product of the village of Mengesta, Penebel, Tabanan. The purpose of this activity is to apply technology to produce a version of the sandalwood type of red rice product into a health food/drink product. The target output is to increase community knowledge and skills in the field of food processing technology and improve the economy of the local community. The method of implementing activities uses the PAP (Participatory Assessment and Planning) method which consists of four main steps, namely: (1) finding problems, (2) identifying potentials, (3) analyzing problems and potentials, and (4) choosing problem-solving solutions. Data were analyzed descriptively and qualitatively. The results of this activity are as follows. (1) Increasing public knowledge and skills in the field of food processing technology by utilizing sandalwood red rice. (2) The creation of a variety of processed red rice products into *angkak* (Red Mold Rice) as health drinks and natural food coloring agents, and (3) increasing community livelihoods which have an impact on improving the local economy.

KEYWORDS: red rice, angkak, natural food coloring, local economy.

1. INTRODUCTION

Mengesta Village, Tabanan Regency, Bali, Indonesia is an agricultural area that has special characteristics because it has natural elevations and soil structures that are suitable for rice cultivation. Having a natural panorama of the mountain ranges and rice fields terraced are beautiful with an area of about 4,437 hectares. The superior product of this region is a rice producer with unique characteristics, namely local red rice, sandalwood species with very good quality (RPJPD, Tabanan Regency: 2006-2025).

Rice produced from farmers in the Mengesta Village area is managed by organic rice farmers who already have a permit or certificate. Quality of rice produced very nice, marketing its already successfully penetrated the consumer of hotels and restaurants that exist in Bali, one of the "Bali Tangi" which is located in the city of Denpasar. There are two Micro Small and Medium Enterprise (MSME) partners in the implementation of this program, namely "UD Arisa Jaya" and "Rama Cake".

Based on the interviews with the owners and employees of UD Arisa Jaya, which was held on the July 28, 2019 in getting information, average production of rice produced by UD Arisa Jaya in one month is 4.5 tons at an average price of IDR 81.000.000.

The second partner is IRT "Rama Cake", producing various types of cakes namely: muffins, and brownies and pastries are traditional Balinese snacks (*jajan upakara*)(figure 4). The type of beverage processing that has been successfully made is red rice tea.

The raw materials needed by the IRT Rama Cake, to do its business, are rice flour and red rice for making tea. The rice used is the result of agricultural production in the Mengesta Village area which is produced by UD Arisa Jaya. In one month, the average cake produced is 10,000 seeds of wet cakes at a price of Rp. 2000/seed and 15,000 pieces of pastries in the form of a typical snack for ceremonies in Bali at a price of Rp. 500/seed. The average price is IDR

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

27.500.000. Apart from that, "Rama cake" also produces red rice tea with consumers not only local residents but also foreign tourists.

The product packaging technique uses simple technology and is packed in plastic wrap and then pressed. In one month, the red rice tea that is successfully produced is around 10 kg at a price of IDR 50.000 to IDR 75.000 per kg. Product marketing is carried out by selling directly to consumers, especially during the holy days of Hinduism. In addition, marketing is also carried out by sending to stores in the Tabanan and Denpasar areas.

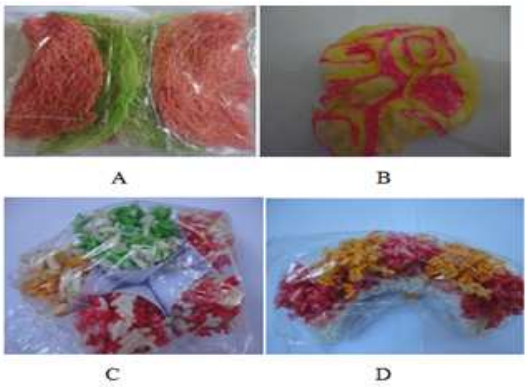

Figure 1. Traditional Balinese Snacks (A. Sirat; B. Uli; C. Gipang; D. Begina) Produced by IRT Rama Cake

Based on the current condition of the two partners, it can be seen that the two partners are developing businesses in similar fields, namely food and agribusiness. They have a strong commitment to optimizing the potential of their regions, both natural potential, human resources, and local culture. This can be seen from the business products that come from local agricultural products, based on local culture.

However, in running their business there are still many obstacles experienced by the two partners that require a touch of science and technology. Through this regional superior product development program (*PPPUD*), it is hoped that the products produced by these two partners can really be used as regional superior products that are able to compete globally. The problems experienced are described below.

Partner Problems

Priority issues that are addressed in the implementation of this *PPPUD* program include: production issues, business management, and marketing. The implementation of the program at this stage is a production problem, namely a lack of understanding and skills in making several versions of products from brown rice and processing products using artificial coloring and flavoring ingredients which tend to endanger health. In addition, local community sources of income are still lacking to be able to meet their daily needs.

The solutions and types of output targeted through this *PPPUD* activity are described in table 1.

Tabe 1. Solutions and Output Target

Solution	Output target
Conducting Training and Mentoring: a. Make a variety of products with the use of technology, which is making brown rice tea, red mold rice/red yeast rice, and various of Balinese cakes (*jajan upakara*). b. Good and attractive product packaging, as well as meeting export quality.	Increased partner knowledge and skills to produce: a. variety of red/black organic rice packaging that meets export quality standards; and b. variety of healthy food products, at least 3 products in the form of: red rice tea, *Angkak*/*Red Mold Rice (RMR*), and traditional Balinese cakes

The solutions offered to solve partner problems, namely by applying technology based on the results of research and relevant theoretical studies.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

2. MATERIALS AND METHODS

Making Red Mold Rice (*Angkak*)

Red Mold Rice (RMR), also known as *red yeast rice* or *angkak,* is fermented rice where the food fungus *Monascus sp is* grown (Shao et al., 2014). RMR is said to facilitate digestion, blood circulation, strengthen intestinal walls or gastric function. RMR is traditionally used as a coloring agent, flavoring agent, and food preservative (Patel, 2016). This RMR product can be added to snacks, meat, fish or soup in the cooking process to give it an attractive color and add flavor.

The genus *Monascus is* divided into 4 species, namely *M.pilosus, M.purpureus, M.rubber, M.floridanus.* Natural pigments that have been extracted are known as food coloring and *Monascus* also produces pigmen which are divided into 3 groups. The three groups are: (1) orange pigments, called *monascorubin* and *rubropunctanin,* 2) yellow pigments, called *ankaflavin* and *mona scin*, and 3) red pigments, called *monascorubramin* and *rubropunctamine*. These pigmen contain proteins, peptides, amino acids and nucleic acids in their products or culture media. (Luo et al., 2018), (Mornar et al., 2013) stated that in the process of fermentation of red yeast rice, the pigments are formed sequentially in the beginning fermentation hypha *M.purpureus* yellow color, then part of the adult ascomata produce color pigments orange and the adult portion of the ascomata produces a red pigment color. To see the yellow pigment, a wavelength of 390 nm is used, while the red color is with a wavelength of 500 nm.

Currently research on *Angkak* has been widely carried out in Indonesia as reported by (Yasuda et al., 2012), (Sudjatinah & Wibowo, 2018) (Feng et al., 2012) , making shrimp paste using natural dyes derived from *angkak* powder, showing the addition of *Angkak* powder by 0.5%, 1%, and 1.5% and a salt concentration of 5% can increase the color of the shrimp paste without causing changes in taste, smell, and texture. (Srianta et al., 2014), reported that rice made from red rice cultivar BP18041F9 has a higher yellow and red pigment than *Angkak* derived from red rice cultivar Bali Butong. The lovastatin content of the two cultivars of red rice tested was in the range of 0.92% on average compared to white rice, namely 0.21to 0.27%.

3. METHODS

The steps for implementing the program use the PAP (*Participatory Assessment and Planning*) method, which consists of four main steps, namely (1) finding problems, (2) identifying potentials, (3) analyzing problems and potentials, and (4) choosing problem-solving solutions (Indonesia, 2008), (Regulation of the Minister of Tourism and Creative Economy of the Republic of Indonesia Number 12 of 2014 concerning Restaurant Business Standards, 2014), (Ye et al., 2002). This method is chosen according to the target output to be achieved. Stages of implementing an activity such as the table 2.

Table 2 : Steps for Program Implementation Using the PAP Method

Finding Problems	Meet Recognize Potential	Analyzing Problems and Potentials	Establish Solutions
Conduct a situation analysis: The problems identified are as follows. (1) Quality of economics society, the average middle income classified, and poor (3.95%). (2) Many potential natural resource that is not yet developed as sources of additional revenue. (3) Lack of understanding and skills in developing creative industrial businesses. (4) The emergence of socio-economic conflicts due to	1. There are sufficient raw materials available that can be used as an additional source of livelihood. 2. Human resources are very potent unlucky to inflate the right of entrepreneurs to take advantage of the products of agriculture local. 3. The target area is developing into an	1. The low quality of the target community's economy is handled by creating creative industrial businesses by utilizing agricultural products. 2. Develop business industrial creative in the field of food processing into a food product healthy. 3. The business developed can be used as one of the sources for implementing agricultural- based educational tourism.	Conduct training and assistance in the application of food processing technology into healthy food products.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Finding Problems	Meet Recognize Potential	Analyzing Problems and Potentials	Establish Solutions
gaps in the level of community income.	educational tourism area.		

Data collection techniques used were observation, questionnaires, and interviews. The data collected in this activity are data on 1) the quality of understanding and skills of partners in applying food processing technology, (2) the number of versions of products that have been successfully made with good quality, and (3) data on opportunities for business development in the food sector to improve the local economy of target community.

Questionnaire about partners' understanding and skills in making food products from red rice, namely *Angkak* and natural food coloring. The understanding and skills assessed include: understanding of the content and benefits of each basic ingredient, accuracy and skills in making the composition of a mixture of basic ingredients, skills in carrying out the production process, skills in product finalization, and skills in product packaging.

The version of the product created is seen based on observations of the quality of the product produced and has potential market opportunities, as well as the many types of products produced. Data on business development opportunities in the food sector to improve the local economy of the target community were sought using a questionnaire distributed to potential consumers.

Questionnaires for understanding and skills of partners in making products are made using a Likert scale with a score range of 1 to 5, consisting of 10 statement items. Score 1 strongly disagrees, score 2 disagrees, score 3 is doubtful, score 4 agrees, and score 5 strongly agrees. The community income questionnaire uses a closed questionnaire.

As the subjects of this activity are 20 of micro small and medium enterprises (MSME) members and *PKK* members in Mengesta village. The sampling technique was carried out by purposive sampling. Questionnaires for public responses related to the development of MSME and new entrepreneurs were distributed to 30 respondents consisting of 20 MSME members and 10 other potential customers.

Data analysis was carried out descriptively and qualitatively. Descriptive analysis was carried out by calculating the average score of community understanding and skills obtained from the given questionnaire. The categories of community understanding and skills were converted as follows.

The difference per category is the highest score minus the lowest score divided into many categories, namely (5-1) / 5 = 0.8. Thus, a conversion guide is obtained as shown in Table 3.

Table 3. Guidelines for Converting Community Understanding and Skills in Making Products

Average Score ($\overline{X}$)	Category
$4{,}2 \leq \overline{X}$	Very good
$3{,}4 \leq \overline{X} < 4{,}2$	Good
$2{,}6 \leq \overline{X} < 3{,}4$	Enough
$1{,}8 \leq \overline{X} < 2{,}6$	Lacking
$1{,}0 \leq \overline{X} < 1{,}8$	Very lacking

(Modified Likert Scale)

Qualitative analysis is carried out through a series of activities, namely: data reduction, data presentation, data interpretation, and drawing conclusions (Miles & Huberman, 2012). In this data analysis, data is arranged by classifying it into certain categories, concepts, propositions or themes. After that, interpretations are held, namely giving meaning and explaining categories, patterns and looking for linkages in an effort to make conclusions.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

4. RESULTS AND DISCUSSION

The quality of public understanding and skills in manufacturing version product red rice

The quality of people's understanding and skills in making versions of red rice products was searched using questionnaires and observations. The results of the questionnaire showed that the quality of people's/subject's understanding in producing *angkak* products was categorized as good. Based on the observations it can be seen that the target community has good skills in making red mold rice/*angkak* products.

In the training activities, many questions from the participants arise regarding the benefits of *angkak* that they will make, what is the impact on health? Besides that, they also asked why all the tools and materials used had to be sterilized first? Before the practice of making *angkak*, all participant questions had been answered properly by the resource person and the training participants had understood well what and how the correct process of making *angkak*.

Figure 4. Implementation of Red Rice Angkak Making Training

Version and quality of the product produced

The red rice product that has been successfully made is *angkak* which functions as a health drink and as a producer of natural dyes that are safe for consumption as food coloring. Red Mold Rice (RMR), also known as red yeast rice or *angkak*, is rice fermentation using grown food mushrooms Monascus sp. RMR can accelerate the digestion process, blood circulation, strengthen the intestinal wall or stomach function. RMR is very safe to use as a coloring agent, flavoring agent, and food preservative. This RMR product can be added to snacks, meat, fish or soup in the cooking process to give it an attractive color and add flavor (Shao et al., 2014).

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

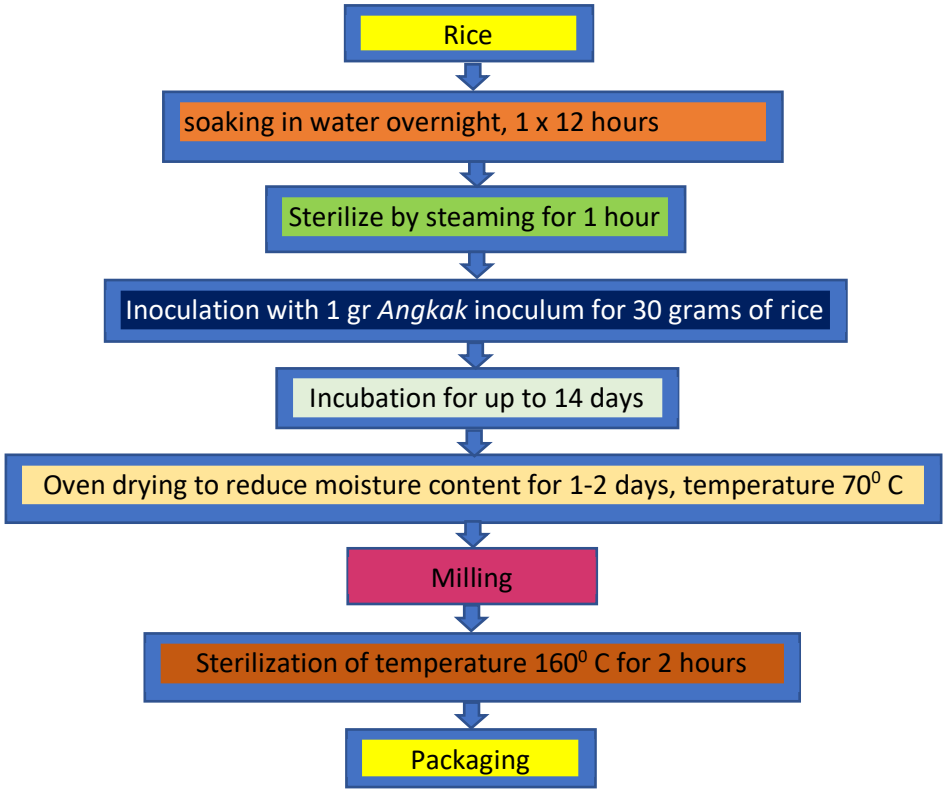

Figure 5. The process of making angkak

The tools needed in making *angkak* include: glass jars, scales, cormorant, spatula, tweezers, mortar and pestle / grain blender, stirring rods, stove and pan. The materials used include M. purpureus/*angkak* isolates, 1200 g of brown rice. The steps for making *angkak* are as follows.

- Sterilizing the tools used.
- Wash the rice and soak the rice in a 1: 1 ratio of water to rice for 1x12 hours to make it easier for mushrooms to grow.
- Drain the rice and steam the rice for 30 minutes so that the rice becomes dry.
- Weighing rice on an analytical balance with a weight of 30 g of rice.
- Perform physical sterilization on the ingredients, namely dry rice using a cormorant for 20 minutes. Which aims to kill all microbes that will interfere with the fermentation process.
- Cool the media for 20 minutes and mix 30 g with 1 gr of starter powder
- Incubate the rice that has been mixed with inoculum for 14 days at a temperature of 27-28^0 C.
- Doing stirring every 2x24 hours.
- Drying the *angkak* using an oven at 70^0 C for 24-48 hours and smoothing it into *angkak* powder.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Figure 6. Fermentation results in 12 days

Figure 7. Angkak that is ready to be ground

Figure 6 shows the results of fermentation for 12 days. The rice color has turned red. Figure 7, the finished *angkak* after the fermentation process for 14 days and has gone through the drying process. *Angkak* that has been produced during the fermentation process produces 3 color pigments, namely: (1) orange pigment, (2) yellow pigment, and (3) red pigment. In the fermentation process of *angkak*, the pigments are formed sequentially, namely at the beginning of the fermentation of *hypha M. purpureus* which is yellow, then the adult ascomata produces an orange (orange) pigment and the adult ascomata produces a red pigment. The resulting colors are very safe to use as food coloring. These pigments contain proteins, peptides, amino acids and nucleic acids in their products or culture media.

Business Development Opportunities in the Food Sector

The opportunities for business development in the food sector are wide open in this region. This is because the raw materials are very abundant with good quality. Based on the results of a questionnaire given to 30 respondents consisting of 20 MSME members, *PKK* members, and 10 other potential customers, the results are as in table 4.

Table 4. Community Response to Business Development in the Food Sector

Average Score ($\overline{X}$)	Many Respondents (people)	Category
$4{,}2 \leq \overline{X}$	20	Very positive
$3{,}4 \leq \overline{X} < 4{,}2$	10	Positive
$2{,}6 \leq \overline{X} < 3{,}4$	0	Enough
$1{,}8 \leq \overline{X} < 2{,}6$	0	Negative
$1{,}0 \leq \overline{X} < 1{,}8$	0	Very negative
Total:	30	

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Based on table 4 it can be seen that the number of respondents who had a minimum "positive" response was 30 people (100%). Neither one had enough, negative or very negative responses.

The results of these community service activities are in line with the results of activities carried out by (Huda et al., 2015), (Permata & Sayuti, 2016) stated that PKK mothers who are trained to make health products from cherry leaves or other herbal products are capable motivating enthusiasm for entrepreneurship. In addition, by utilizing regional sources of excellence as products of economic value will encourage the growth of MSME in target areas which have a direct impact on local economic growth. This is in line with the results of community service activities carried out by Murdani, et al. (2018) stated that MSME have an important role in driving economic growth and have a big share in employment.

The results achieved after the implementation of training in making Angkak in the target areas are as follows. (1) Increasing public knowledge and skills in the field of food processing technology by utilizing sandalwood brown rice. (2) The creation of processed red rice products into angkak as a health drink and a producer of natural food coloring agents, and (3) an increase in the source of people's livelihoods which will result in an increase in the local economy.

5. CONCLUSION

Based on the results of the implementation of the regional superior product development program in Mengesta village, it can be concluded that MSME and *PKK* women in Mengesta village are very enthusiastic and interested in developing food processing businesses from red rice to health food and beverage products. The healthy food products produced are *angkak* and food products using natural dyes. The target community is very enthusiastic about making this product and making it a source of new entrepreneurship, which will lead to an increase in the local economy. It is recommended that related parties continue to provide guidance and assistance so that the business that has been initiated can run optimally. One of them can be used as a mainstay commodity sold in Village-owned enterprises (*Bumdes*) in the local village.

6. ACKNOWLEDGEMENTS

We would like to thank DRPM Kemenristekdikti who has provided a PKM-PPPUD grant for this first year with a contract number: 086/SP2H/PPM/DRPM/2019.

7. FUTURE SCOPE

In future, more robust algorithm can be used to hide the image into video frames using multiple number generated series. Multiple compression techniques can also be used to compress the data to be hidden in the video file.

REFERENCES

[1] Feng, Y., Shao, Y., & Chen, F. (2012). Monascus pigments. In Applied Microbiology and Biotechnology . https://doi.org/10.1007/s00253-012-4504-3
[2] Hud a, S., Sahputra, A., Anggono, WA, & Wahyuni, R. (2015). The Utilization of Kersen Leaves (Muntingia Calabura) As A Jelly Candy To Consumer Acceptance. Food Technology : Information and Communication Media Scientific Agricultural Technology . https://doi.org/10. 35891 / tp.v6i1.463
[3] Indonesia, DPR (2008). Indonesian Creative Economy Development Plan 2025. Ministry of Trade of the Republic of Indonesia . https://doi.org/10.1017/CBO97 81107415324.004
[4] Luo, F., Li, L., Wu, Z., Yang, J., Yi, X., & Zhang, W. (2018). Development of new red mold rice and determination of their properties. LWT - Food Science and Technology . https://doi.org/10.1016/j.lwt.2017.08.088
[5] Miles, MB, & Hube rman, M. a. (2012). Qualitative Data Analysis: A Resource Book On New Methods. In Univ ersitas Indonesia_UI Press .
[6] Mornar, A., Serti ć , M., & Nigovi ć , B. (2013). Development of a rapid LC / DAD / FLD / MSn method for the simultaneous determination of monacolins and citrinin in red fermented rice products. Journal of Agricultural and Food Chemistry . https://doi.org/10.1021/jf304881g
[7] Regulation of the Minister of Tourism and Creative Economy of the Republic of Indonesia Number 12 of 2014 concerning restaurant business standards, the Ministry of Tourism and the Creative Economy of the Republic of Indonesia (2014). https://doi.org/10.1016/j.bbapap.2013.06.007.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

[8] Patel, S. (2016). Functional food re d yeast rice (RYR) for metabolic syndrome amelioration: a review on pros and cons. In World Journal of Microbiology and Biotechnology . https://doi.org/10.1007/s11274-016-2035-2
[9] Permata, DA, & Sayuti, K. (2016). The manufacture of Instant Powder Drink from Various Parts of Meniran (Phyllanthus niruru) Plants. Andalas Agricultural Technology Journal .
[10] Shao, Y., Lei, M., Mao, Z., Zhou, Y., & Chen, F. (2014). Insights into Monascus biology at the genetic level. In Applied Microbiology and Biotechnology . https: // d oi.org/10.1007/s00253-014-5608-8
[11] Srianta, I., Ristiarini, S., Nugerahi, I., Sen, SK, Zhang, BB, Xu, GR, & Blanc, PJ (2014). Recent research and development of Monascus fermentation products. In International Food Research Journal (Vol. 2 1, Issue 1, pp. 1 - 12). https://doi.org/10.3844/ajassp.2010.1195.1199
[12] Sudjatinah, S., & Wibowo, CH (2018). Differences In Effect of Giving Ladies In Making Chicken Sausage Towards Physical And Oral Properties. Journal of Engineering and Technology Development . htt ps: //doi.org/10.26623/jprt.v13i2.934
[13] Yasuda, M., Tachibana, S., & Cuba-Miyara, M. (2012). Biochemical aspects of red koji and tofuyo prepared using Monascus function. In Applied Microbiology and Biotechnology . https://doi.org/10.1007/s00253- 012-4300-0
[14] Ye, XJ, Wang, ZQ, & Lu, JB (2002). Participatory assessment and planning approach: Conceptual and process issues. Journal of Sustainable Agriculture . https://doi.org/10.1300/J064v20n02_09.