

1 **1 Objective**

2
3 This Code addresses Good Cultivation Practices (GCP) for Mushroom that will provide
4 specific guidance to promote product safety and quality, ensure worker's health, safety
5 and welfare and minimize occurrence of microbial, chemical and physical hazards
6 associated with production of mushroom meant for human consumption.

7
8 This Code also aims to promote sustainable production and enhance competitiveness of
9 mushroom for domestic use and international trade.

11 **2 Scope, Use and Definition**

12 **2.1 Scope**

13 This Code covers relevant practices for the cultivation of mushroom. The provisions of
14 the Code addresses food safety, produce quality, worker's health, safety and welfare and
15 environmental management.

16 **2.2 Use of the Document**

17 This Code considers the relevant provisions of the *Penn State University and American*
18 *Mushroom Institute's Mushroom Good Agricultural Practices (GAP) Program* and other
19 relevant national and private standards for the production of mushroom.

20 The provisions of this document are supplemental to and should be used in conjunction
21 with the *Philippine National Standard (PNS) for Mushroom (PNS/BAFS xx:20_)*. Relevant
22 provisions that pertain to practices that minimize hazards affecting produce quality,
23 workers health, safety and welfare and environment are expounded in this Code.

24 **2.3 Definitions**

25 For the purpose of this standard, the following definitions apply:

26 **2.3.1**

27 **agricultural input**

28 any incoming material like mushroom spawn, agro-industrial residues as substrates,
29 organic and inorganic fertilizers, water and agricultural lime used for the primary
30 production of mushroom

32 **2.3.2**

33 **breezeway**

34 means a connection between an accessory building and a principal building that is not
35 heated or insulated and is not restricted by intervening doors

36 **2.3.3**37 **contaminants**

38 substances that include physical, chemical and microbial that are not inherently present
39 in mushroom

40

41 **2.3.4**42 **contamination**

43 introduction or occurrence of a hazard into the environment

44

45 **2.3.5**46 **disinfection**

47 reduction by means of chemical agents and/or physical methods in the number of
48 microorganisms in the environment to a level that does not compromise food safety or
49 suitability

50

51 **2.3.6**52 **farm**

53 any premise or establishment in which mushrooms are grown and harvested and the
54 surroundings under the control of the same management

55

56 **2.3.7**57 **hazard**

58 biological, chemical or physical agent in food with a potential to cause adverse effect on
59 human health

60

61 **2.3.8**62 **mushroom**

63 visible fruiting body of an edible mold which either grow wild or are cultivated

64

65 **2.3.9**66 **pasteurization**

67 process of eliminating the vegetative cells (excluding the resistant structures such as
68 endospores of bacteria and fungal spores) of undesirable microorganisms by steaming
69 the solid substrates at 60 - 80 degree celsius, for 4 - 6 hours.

70

71 **2.3.10**72 **pest**

73 unwanted animal, plant or microorganisms that affects the production, quality and
74 safety of mushroom– for example, insects, diseases, weeds, rodents and birds

75

76 **2.3.11**77 **primary production**

78 growing and harvesting of mushroom including substrate preparation, inoculation,
79 incubation, watering and harvesting

80

81 **2.3.12**

82 **risk**

83 likelihood of an adverse health effect and the severity of this effect following exposure
84 to a hazard

85

86 **2.3.13**

87 **risk assessment**

88 scientific evaluation of known or potential adverse health effects resulting from human
89 exposure to biological, chemical and physical hazards

90

91 **2.3.14**

92 **sterilization**

93 process of totally eliminating all forms of microorganisms in a solid substrate by steaming
94 above atmospheric pressure (15 pounds per square inch), 121 C degree celsius for 15
95 minutes to 1 hour (depending on the nature of substrate and volume)

96

97 **3 Primary Production**

98

99 **3.1 Environmental Hygiene**

100

101 Evaluation of the area will be conducted in order to assess if it will pose significant risk
102 to the production of mushroom (i.e. presence of pests) or whether the agricultural
103 activity will have a potential impact to adjacent sites.

104

105 The site should be categorized into low, medium or high risk depending on the hazard
106 or contaminants identified and its impact. Recommendation on the actions to take for
107 the risks observed should be made by a competent authority. If the contaminants are
108 found to be at unacceptable levels, the site should not be used for production until
109 corrective or control measures are carried out.

110

111 The corrective actions implemented should be monitored for its effectiveness and the
112 results of the monitoring should be properly recorded. If only remedial action is
113 required to manage the risk, the action taken should be regularly monitored to ensure
114 that contamination of the produce is kept within acceptable levels.

115

116 Adjacent land, buildings and facilities in the site should be observed and properly
117 maintained to ensure that these will not be sources of hazards. Likewise, the site should
118 be managed to ensure minimal impact to the environment.

119

120 **3.1.1 Farm Location**

121

122 The production area and adjoining sites or farms should be evaluated for its suitability
123 for agricultural land use. Moreover, if necessary, the production site must comply with
124 related and applicable regulations of the Department of Environment and Natural
125 Resources (DENR) and Local Government Units (LGUs).

126

127 Based on the results of the risk assessment, the primary production of mushroom
128 should not be carried out in the areas where the presence of potentially harmful
129 substances or hazards would lead to: inability to have a viable production or presence
130 of contaminants at unacceptable levels that may affect safety.

131 In order to assist the farmer in evaluating the possible sources of contamination and/or
132 for monitoring purposes, a property layout map within the site should be prepared to
133 indicate the location(s) of the following, as applicable:

134

- 135 • substrate preparation area
- 136 • clean area (isolation and inoculation)
- 137 • working shed
- 138 • incubation room
- 139 • production area (mushroom growing house)
- 140 • postharvest processing area
- 141 • sources of water used on the farm (well, reservoir, rivers, lakes, farm
142 ponds, etc.)
- 143 • solid waste disposal area;
- 144 • property buildings, structures, road and canal networks; and

145

146 When constructing facilities, relevant local government requirements should be
147 followed.

148

149 It is also necessary that remedial action be taken for any identified risk that can affect
150 the environment and worker's health, safety and welfare. A record should be kept on
151 the actions taken and the results of monitoring. In the evaluation of the production area
152 and adjoining sites or farms, the following should be evaluated for the potential sources
153 of contamination:

154

- 155 • Previous land use;
- 156 • Slope;
- 157 • Proximity to high risk production sites;
- 158 • Potential microbial hazards including fecal and organic waste contamination

159 and potential environmental hazards that could be carried to the growing site;
160 and

- 161 • The access of domestic and wild animals to the site and to water sources used in
162 primary production.

163

164 If previous uses cannot be identified, or the initial assessment of growing or adjoining
165 sites leads to the conclusion that potential hazards exist, this should be further
166 substantiated through analysis and characterization of the likely contaminants.

167

168 Other considerations on site selection, which may affect the cultural management later
169 are the following:

- 170 • Topography
- 171 • Soil
- 172 • Soil drainage (for *volvariella*)
- 173 • Elevation (temperate/tropical)
- 174 • Temperature

175

176 **3.1.2 Site Selection and Evaluation**

177 During site selection and evaluation, potential sources of contamination from conduct of
178 various operations that may pose significant risk to product quality, workers health and
179 environment and infestation of nearby pests should be identified and remedial actions
180 should be taken to address these.

181 In particular, the production site should be plain, shady and well-drained. It should be
182 kept clean and maintained regularly. The chosen site, if applicable, should be
183 constructed near a good source of water with well ventilation at all times to ensure the
184 quality of the produce.

185

186 **3.1.3 Site Management**

187

188 The name of the farm should be displayed at the entrance. Site signage identifying the
189 farm should be displayed for easy recognition.

190

191 Entry of stray animals should be avoided, as they can be sources of contaminants that
192 may affect the production, quality of produce and pose risk to the worker's health and
193 safety. Waste segregation of biodegradable and non-biodegradable wastes should be
194 provided. Non-biodegradable waste should be segregated from biodegradable waste
195 materials. Biodegradable wastes should be disposed of in a manner that it will not
196 become a source of contamination in the farm. Composting of biodegradable waste is
197 highly encouraged.

198 3.1.4 Site sanitation

199

200 Critical areas where potential food safety hazards exist are needed to be identified and
201 control measures taken to prevent product contamination. Packing, handling, and
202 storage areas that can be sources of contamination should be identified. Cleaning and
203 sanitation procedures should be prepared and followed.

204

205 3.1.4.1 Contamination prevention measures

206

207 Measures should be taken in order to ensure that the production area is free from
208 possible sources of contamination (e.g. litter, etc.). There should be a control on the
209 vehicular traffic between substrate preparation and growing areas in order to prevent
210 cross contamination.

211 The litter and trash should be covered in containers on well drained surfaces and be
212 removed regularly from the premises.

213

214 3.1.4.2 Ground

215

216 The ground of the mushroom production site shall be cleaned on a scheduled basis and
217 maintained so it will not become a source of contamination. The grounds should be kept
218 reasonably free of tall grass and weeds, litter, debris, trash, unnecessary stored
219 equipment and standing water.

220

221 3.1.4.3 Animals / Pests

222

223 Domestic farm and wild animals must be restricted from the production site and from
224 areas where mushroom are prepared, packed, and temporarily held. A kilometer away
225 should be observed to separate the mushroom cultivation area from the animal
226 production site. If possible, barriers should be constructed to prevent entry of animals.
227 The buildings for growing mushroom should be maintained to prevent the entry points
228 for animals and pests. It includes keeping building foundations, walls, roofs and gutters
229 in good repair, exterior doors and windows intact and sealed and outside entrances
230 closed when not in use, or if applicable, have screens installed.

231

232 The equipment and other materials should be stored at a sufficient distance from
233 buildings so they will not serve as an entry and eventually a breeding place for pests.

234

235 3.1.4.4 Breezeway and growing rooms

236

237 The breezeway and growing rooms shall be kept clean and uncluttered. The amount of
238 materials stored in breezeways and staging areas should be minimized in order to have

239 an adequate space for movement of workers and equipment. A sufficient space between
240 the interior walls and stored materials should be maintained to allow conduct of pest
241 inspections.

242

243 **3.2 Hygienic Production of Mushroom**

244 **3.2.1 Preparation of the culture medium**

245 The formulation of an appropriate culture medium should be considered for the
246 successful cultivation of the fruiting bodies of mushroom. The culture medium should
247 be prepared in aseptic condition with the use of autoclave or sterilizer in order to obtain
248 a pure culture of mushroom.

249 **3.2.2 Tissue culture**

250 An important step in spawn and mushroom production is tissue culture. Thus, clean and
251 healthy fruiting bodies of mushroom should be selected for tissue culture. This can be
252 done by choosing the unexposed part of the healthy mushroom and not an over-
253 matured fruiting body. Extra care is recommended when doing tissue culture since it is
254 prone to microbial contamination. In addition, the procedure should be done in a clean
255 room with appropriate illumination, controlled ventilation and sterile tools. The
256 inoculated medium should be incubated at the appropriate temperature depending on
257 the kind of mushroom desired to be grown.

258 **3.2.3 Choice of mushroom spawn**

259 Aside from yield quantity and quality as basic considerations, species to be grown
260 should be selected based on market requirements, grower preference and adaptability
261 to locality. Considerations for choice of mushroom culture are the source, species,
262 culture generation (up to f4 only) and date of preparation.

263 If the culture is obtained from another farm or laboratory, a record is kept of the name
264 of the supplier and the date produced.

265 **3.2.3.1 Grain Spawn**

266 Grain spawn may be made from cereal-based substrates namely unmilled rice, corn,
267 wheat, and sorghum. The incubation period may usually last for 21 days to 1 month.

268 **3.2.3.2 Planting Spawn**

269 Planting spawn, which is applicable for *Volvariella volvacea*, naturally grows on
270 decomposing piles of plant residues. Plant residues which underwent pasteurization/
271 sterilization should be inoculated onto beds, trays or crates of formulated substrates.

272 Consequently, the spawn should be incubated to produce massive fruiting bodies of
273 mushroom. Incubation period may usually last for 2-3 weeks.

274 **3.2.4 Substrate**

275 Raw materials to be used as substrate should be appropriate for the desired mushroom
276 species to be grown.

277

278 Unpasteurized substrate should be received and stored as far away as possible from
279 receiving areas where harvest containers, packaging materials, spawn, and other
280 sanitary supplies are received or where mushrooms are shipped.

281

282 Where necessary, the substrate preparation areas should be covered to prevent run-off
283 or should be constructed with barriers such as concrete blocks, soil berms, pits, or
284 lagoons to divert or collect run-off. Moreover, ingredients for substrate preparation
285 should be protected from pest contamination and water run-off by storing them in a
286 covered and dry location that is physically separated from other substrate preparation
287 areas.

288

289 Substrate preparation procedures shall be based on relevant scientific principles that
290 reduce potentially harmful microorganisms to acceptable levels. Substrate should be
291 pasteurized/ sterilized to reduce harmful microorganism to safe levels.

292

293 **3.2.3 Agricultural Input Requirements**

294 Agricultural inputs should not contain contaminants at levels that may adversely pose
295 significant risk to the production of mushroom such as aspects affecting quality of
296 produce or safety, as far as practicable, worker's health and welfare and environmental.

297 **3.2.3.1 Water for primary production**

298 The suitability of water for growing mushroom should be tested before usage not less
299 than every six (6) months. If the water quality is crucial for the growth of the
300 mushroom, water should be sampled at least once at the beginning of production and
301 submitted to an accredited laboratory for microbial analysis. Results of the laboratory
302 analysis should be kept and recorded.

303 The quality of water for production of mushroom should conform to the guidelines set
304 by the Republic Act: 9275 or the Philippine Clean Water Act of 2004. Moreover, the
305 water to be used in the production process should be obtained from a source which is
306 not exposed to any risk of contamination like wastewater from industrial factories or
307 activities that can cause hazardous materials.

308 The risk of mushroom contamination from the water used for production, washing,
309 cleaning, sanitation and other forms of handling mushroom should be assessed and
310 categorized. Furthermore, the proximity of water sources on possible sources of
311 contamination should be considered during assessment. A record is kept of any
312 significant hazards identified and the assessment of the category where the hazard
313 should be included. If contamination occurs, corrective actions or treatments to
314 minimize the risks should be carried out and documented properly.

315

316 **3.2.4 Harvesting parameters to ensure produce quality**

317 The quality of the mushroom can be lost at any step during preparation, production,
318 harvesting and post harvesting handling. Injuries from poor handling practices that can
319 cause loss of mushroom quality should be minimized and/or prevented.

320 Harvest of mushroom should only be done during the right stage of development.
321 Proper harvesting techniques should be employed to optimize the quality and other
322 desired characteristics of mushroom and to prevent possible sources of contamination.
323 Mushrooms that spill on the floor or ground shall be considered contaminated and
324 discarded since these are no longer considered edible.

325 Materials, tools and equipment used in harvesting practices should be cleaned and
326 designed and handled in a way that it will not pose harmful impact to the produce.
327 Workers should harvest the mushroom with care and assess the quality of the produce
328 prior to post-harvest. Preventive measures for any hazardous contamination should be
329 followed and practiced.

330 During harvesting, a responsible person should be present to supervise the activity at
331 all times and to assure that harvesters observe hygienic practices.

332 **3.2.4.1 Tools and equipment associated with mushroom production**

333 Harvesting tools, containers, implements and equipment that have direct contact with
334 the mushroom should be cleaned, disinfected and maintained in good order regularly
335 and prohibited from any use other than holding mushroom unless clearly marked. This
336 is to prevent infection of damaged mushroom to undamaged ones.

337 Reusable harvest containers should be kept in good repair, free of splinters or shards,
338 and cleaned using products approved for food contact surfaces before each use. The
339 cleaned containers should be stored in a clean and dry location where they can be
340 protected from contamination. Containers that are damaged and can no longer be kept
341 in a hygienic condition should be discarded.

342 Exposed harvest containers in staging areas shall be protected from physical hazards,
343 condensate and floor splash by covering them with plastic or paper sheets to prevent
344 contamination. Moreover, these harvest containers shall not be permitted to have a
345 direct contact with the floor during packing or storage. Stools, carts, pallets or on a
346 dedicated and clearly marked or color coded inverted container should be used to
347 prevent the underside of the harvesting containers from contacting the floor. Movement
348 of the filled harvesting containers from the production areas should be done by placing
349 them on movable carts or by other effective means.

350 An equipment maintenance program should be in place that ensures that all equipment
351 used to control food safety hazards is in proper working order and does not contribute
352 to product contamination. All equipment used should be maintained and calibrated in a
353 regular scheduled basis. Food grade lubricants should be used on food contact surfaces
354 and machineries.

355

356

357 **4 Handling, Storage and Transport**

358

359 Handling of the mushroom should be conducted with the consideration of minimizing
360 contamination and ensuring product quality is maintained. Growers during this
361 operation should ensure that clean containers and equipment are used and efforts
362 towards ensuring that these containers do not come in contact with other sources of
363 contaminants are done.

364

365 Whenever applicable, prior to transportation, mushroom should be packed in the field
366 in such a way that it can withstand rough handling during loading and unloading,
367 compression from the weight of other containers, impact and vibration during
368 transport. It should be stored and contained under conditions that will minimize the
369 potential for microbial, chemical or physical contamination.

370

371 Damaged containers or transport trailers are replaced as necessary. When not in use,
372 containers and transport trailers should be cleaned, covered and kept in a protected
373 location.

374

375

376 **5 Post-harvest**

377

378 Harvested mushrooms may be sorted/ packed on the field or may be transported to a
379 common packing house facility. Mushroom to be sorted out should not be placed in
380 direct contact to the ground/floor to avoid cross-contamination of the produce.
381 Mushroom should be sorted according to the specifications set under the Philippine

382 National Standard for Mushroom (PNS/BAFS __: 201__). Damaged and diseased
383 mushroom should be discarded to avoid cross-contamination of the whole lot.
384 Sorters/packers of mushroom should wash their hands with soap or detergent before
385 handling the produce.

386

387 The mushroom should be transported using clean and secure trucks or other
388 appropriate mode of transportation. The trucks should not be previously used to
389 transport animals and its products or other potentially contaminated materials unless
390 they are cleaned before loading the mushroom. When transport vehicles are used for
391 other purposes aside from transporting harvested produce, it should be cleaned prior to
392 usage to avoid the contamination of the produce. Moreover, these trucks should be
393 inspected for its cleanliness, odors and dirt or debris before loading the harvested
394 mushroom.

395

396 Storage facilities and vehicles for transporting the harvested mushroom should be built
397 in a manner to minimize damage to the produce and to avoid access by pests. They
398 should be made of materials that permit easy and thorough cleaning.

399

400

401 **6 Establishment: Design and Facilities**

402 **6.1 Premises and lay-out**

403 The design of the production, packing and storing areas of the mushroom should be
404 constructed and maintained to minimize the loss of the quality of the mushroom and, if
405 applicable, the risk of contamination. In particular, the building and its structure should
406 allow thorough cleaning and if necessary disinfection, including drying pavements, to
407 ensure that pathogens do not grow in the facility or on the equipment.

408 Buildings should be maintained to prevent physical hazards, condensate, and floor
409 splash from contaminating mushrooms. Poison bait stations should be used and located
410 on the outside of buildings.

411 Grease, oil, fuel and machinery should be properly separated from the production area.
412 In addition, agricultural inputs and substrates should have separate storage areas.
413 Materials used for pest control such as nets, baits and traps should be inspected on a
414 regular basis, maintained and replaced when destroyed. Live traps, glue boards or
415 mechanical traps should be spaced no greater than 30 feet apart along the inside wall of
416 buildings and at the both sides of an entrance, excluding breezeways and growing
417 rooms.

418 **6.2 Drainage and waste disposal**

419 A waste management plan should be developed, followed, and documented including
420 identifying types of waste products generated by property activities and using practices
421 to minimize waste generation, reuse or recycle waste and store and dispose waste. The
422 wastes products should be stored with labels, covered and disposed on a scheduled
423 basis.

424 Effective waste disposal system should be used and maintained in good condition to
425 avoid contamination. Sewage, waste disposal and drainage systems are constructed to
426 minimize the risk of contaminating the production site and water supply.

427

428 **7 Worker's Health, Safety and Welfare**

429 **7.1 Labor conditions**

430 Employers must ensure that the working conditions are suitable for the workers.
431 Workers must be treated in accordance to rules and regulations set by the Department
432 of Labor and Employment (DOLE) for the agricultural sector. New workers are informed
433 about the risks associated with health and safety when starting at the worksite.

434

435 All workers should comply with the country's regulation of the minimum working age
436 which is 18 years of age and above. Workers that are below 18 years of age may be
437 allowed to help in the production of mushroom under strict conditions that includes
438 considerations on: appropriateness of assigned work versus the age and physical
439 condition of the worker, duration of working hours, working condition, and availability
440 of supervision and guidance during operations.

441

442 **7.2 Personal hygiene**

443 All workers should have knowledge, act and maintain an appropriate degree of personal
444 cleanliness. Moreover, workers shall be trained and shall follow the recommended
445 personal hygienic and sanitary practices.

446 There shall be a strict observance of the "no smoking", "no spitting" and "no eating"
447 policy inside the mushroom growing and handling areas since these practices will
448 induce contamination.

449 Any person who has or appears to have an illness, infectious disease or open lesion
450 including boils, sores, or infected wounds, or any other abnormal source of microbial
451 contamination must be excluded from any operations. Hygienic practices through
452 established/documentated procedures including specific instructions should be made for
453 all personnel.

454 Workers should follow personal hygiene recommendations as indicated in the
455 FDA/BFAD Revised Guidelines on Current Good Manufacturing Practice in
456 Manufacturing, Packing, Repacking or Holding Food (AO No. 153 s.2004) or the latest
457 issuance and the Codex Recommended International Code of Practice General Principles
458 of Food Hygiene (CAC/RCP 1-1969, Rev. 4-2003) or the latest issuance. The following
459 recommendations should include but not limited to:

460 7.2.1 Wearing of appropriate clothing and shoes applicable to the operation and can
461 serve as protection for food contamination and an aid on the worker's health and
462 welfare.

463 7.2.2 Wearing of appropriate masks, hair restraints such as hairnets, caps and bandanas,
464 gloves while growing and handling mushroom.

465 7.2.3 Prohibition on wearing of jewelry and other personal items that can fall into the
466 product.

467 7.2.4 Movement of workers and visitors between mushroom growing and substrate
468 preparation or staging areas shall be controlled to prevent cross contamination.

469 Attention should be given to availability of hand-washing facilities equipped with soap
470 and clean water during before and after all the recommended practices for the
471 production of mushroom. Workers in mushroom growing and handling areas shall wash
472 their hands before beginning work, each time they use the toilet, after any absence from
473 their workstation for breaks or lunch, or after handling soiled materials. When gloves
474 are used in the operation, there should be a proper and regular cleaning and sanitation.
475 However, gloves that are disposable in nature should be discarded after use.

476 Written instructions (e.g. pictogram on proper hand washing) on personal hygiene
477 practices should be provided to workers. These signs should be posted in prominent
478 locations. Employers should keep track of evidence that hygiene instructions are
479 followed.

480

481 First-aid and emergency instructions should be documented and conspicuously
482 displayed in strategic locations.

483

484 **7.3 Trainings**

485 Upon hiring and on a regular basis, employers and workers should have appropriate
486 knowledge or be trained in their area of responsibility such as operating equipment
487 and tools, accident and emergency procedures and personal hygiene. Training and re-
488 orientation of the workers should be done at least once per year. A comprehensive
489 training in general food safety and food safety control systems to supervisors and

490 managers. Evidence on the conduct of training should be kept. Moreover, the employers
491 should keep track of evidence that hygiene instructions are followed.

492

493

494 **8 Documentation and Records**

495 Where appropriate, records should be maintained to adequately reflect production
496 information, and product information. Maintaining adequate documentation and
497 records of primary production and post-production operations is important in the event
498 of recall of mushroom. Records should be made to facilitate recalls and product safety
499 investigations, if required and should be made available upon request.

500 Records should be kept on the:

- 501 • raw materials;
- 502 • types, sources and preparation procedure of substrates ;
- 503 • sources of spawn;
- 504 • type of agricultural inputs;
- 505 • water management practices;
- 506 • water quality and analysis;
- 507 • processing including the date, method and final volume of product; and
- 508 • pest control and cleaning schedules of premises, facilities, equipment and
509 containers.

510

511 **9 Traceability and recall**

512 Each farm should have a program in place for tracking and responding to a need to
513 recall mushroom. A copy of contact information and trace-back procedures required by
514 each packer/shipper should be maintained. Procedures should be developed for rapidly
515 complying with any recall/trace-back requests from customers. Annual mock recalls
516 should be conducted to verify compliance with the standard.

517

518

519

520

521

522 References:

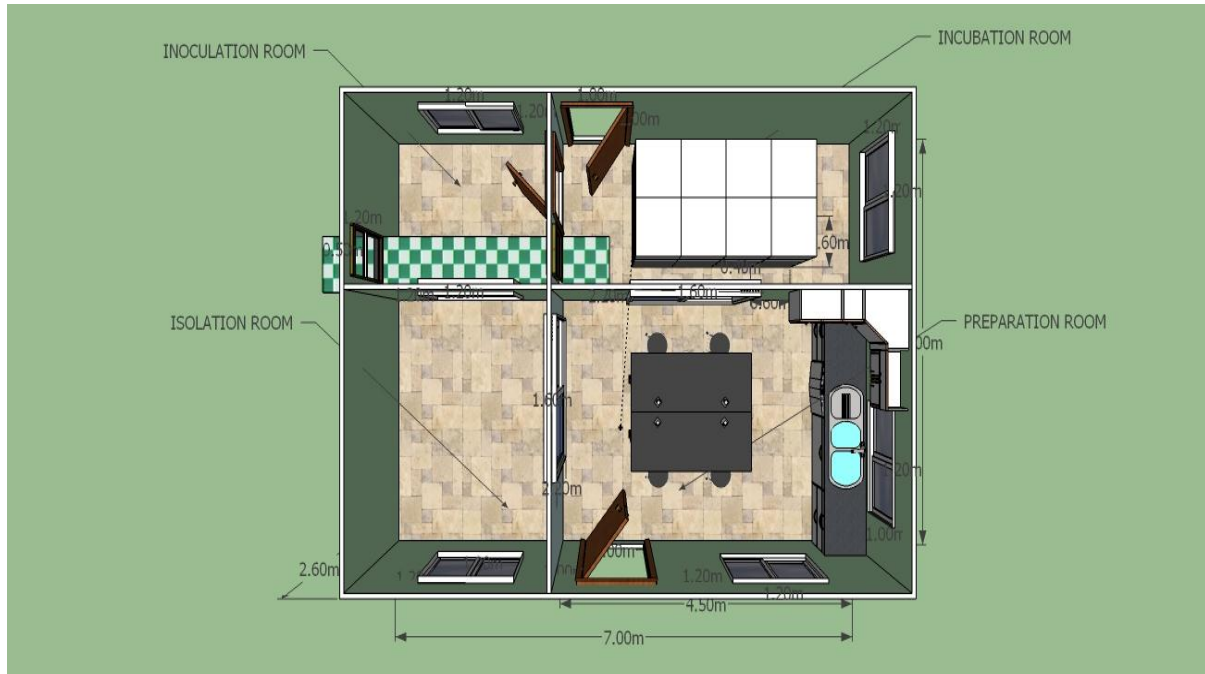
- 523 Central Luzon State University. (2009). *Mushroom Growing in Tropics: A Practical Guide.*
524 Philippines.
- 525 Penn State University and American Mushroom Institute. (2010). *Mushroom Good*
526 *Agricultural Practices (GAP) Program: Industry –Wide Food Safety Standards for*
527 *Fresh Mushroom Growing, Harvesting, and Shipping.*
- 528 Perfect-Father Mushroom Trading. (2016). *Perfect Mushrooms: Simpleng Gabay sa*
529 *Pagpaparami at Pagpapatubo ng Oyster Mushroom.*
- 530 Southern Cagayan Research Center. *Technopackage: Mushroom Production Guide.*

531

ANNEX A

532

Laboratory lay-out design



533

534

535

ANNEX B

536

Right stage to harvest mushroom

Species of Mushroom	Description
<i>Volvariella volvacea</i>	Button Stage (Egg-shaped) When the volvariella or the universal veil is not broken
<i>Pleurotus</i> (white, gray, yellow, pink)	Once fruit has opened and formed petal or flower-like stage
Button	Button stage

537